CHAPTER 3 – AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources within, adjacent to, and associated with the RDG project, as well as the resources identified during the scoping process and Interdisciplinary Team review as having the potential to be affected by project-related activities.

Critical elements of the human environment (BLM 1988b), their status in the Project Area, and their potential to be affected by the project are identified in Chapter 1, Section 1.7, of this EIS. Some elements of the human environment were not analyzed for impacts, as noted in Chapter 1, and thus are not discussed further in this chapter:

- Areas of Critical Environmental Concern, prime or unique farmlands, designated wilderness, Wilderness Study Areas, and Wild and Scenic Rivers do not occur within the Project Area, although areas with wilderness characteristics do occur and are, thus, described in this chapter.
- There are no interests or properties held in trust for Tribes in the Project Area.
- Environmental Justice and Native American religious concerns were not identified as elements for analysis.
- A separate rangeland health analysis has not been prepared.

3.1 GEOLOGY AND MINERALS

3.1.1 PHYSIOGRAPHY AND TOPOGRAPHY

The RDG Project Area is part of the Eastern Tavaputs Plateau portion of the Uinta Basin (Clark 1957). The elevation of the Tavaputs Plateau increases to the south, and intermittent streams and washes flow northward to the White River. These major streams and washes (i.e., Bitter Creek, Atchees Wash, west, center, and east forks of Asphalt Wash, west fork of Saddletree Draw, and Long Draw) form deep canyons that are prone to flash flooding. The drainage density of these streams is low, and they are widely spaced, with 2-6 miles between major drainages. The drainages are divided by discontinuous hills and ridges composed of resistant sandstones. Elevations within the Project Area range from approximately 5,575 feet in Section 1 of T11S, R23E, to 6,560 feet in Section 25 of T12S, R24E.

3.1.2 STRATIGRAPHY

The stratigraphic relationships of the formations in the region and in the RDG Project Area are illustrated in Figure 3-1 (Hintze 1988). Inter-bedded (thinly bedded) shales, siltstones, and sandstones of the Uinta Formation are exposed at the surface over most of the Project Area. However, shales of the Green River Formation outcrop in the deeper drainages in the northern portion of the Project Area. The primary targets of the project are the Wasatch Formation and Mesaverde Group. Secondary targets include the Dakota Formation and the Weber Formation, which are older and found below the primary targets.

The Project Area lies within two, tight, gas sand designation areas for the Wasatch/Mesaverde Formations and the Dakota Formation (Spenser and Wilson 1988). The reservoir rocks in the Wasatch Formation are ancient river channels that trend in a north-northwest direction. The reservoir rocks of the Mesaverde Group are sandstones that were deposited in a delta environment. Gas production problems are possible within the Mesaverde Group and Wasatch Formation due to the tight and thoroughly cemented sandstone beds that reduce the porosity and permeability of the reservoir.

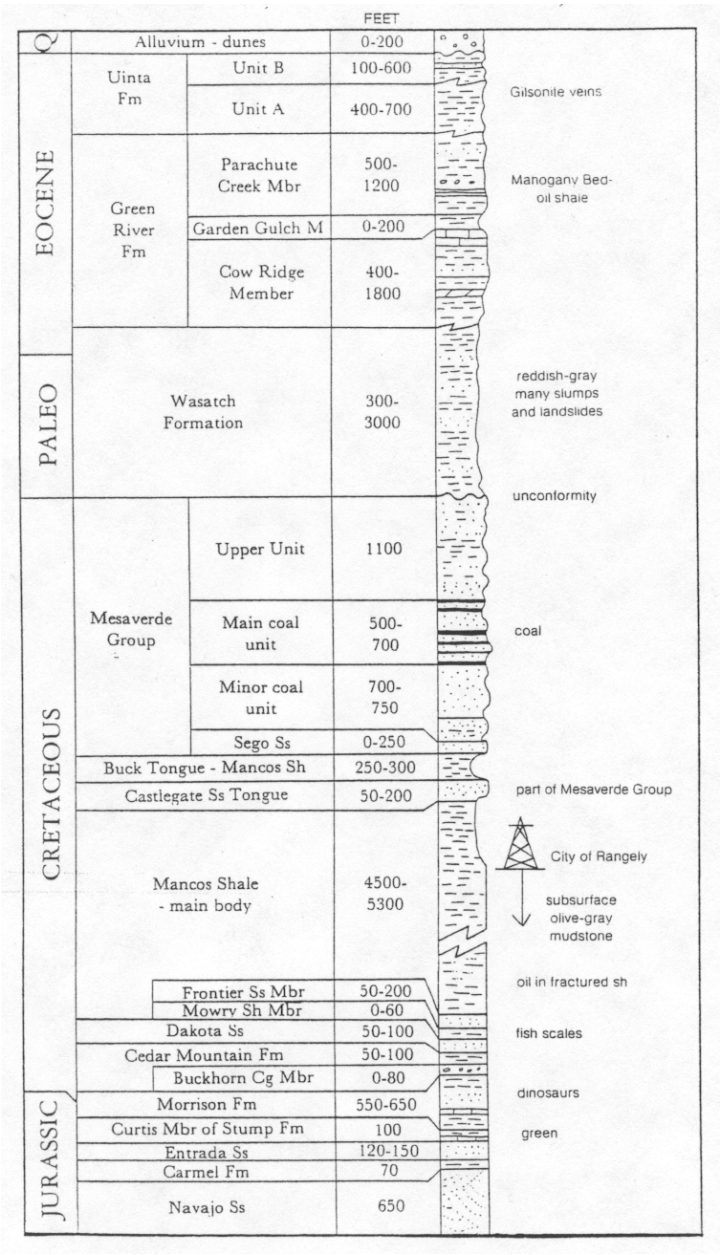

Figure 3-1. Stratigraphic column of geologic formations within the RDG Project Area (modified from Hintze 1988).

3.1.3 STRUCTURE

Beds in the Project Area dip gently to the northwest, and there is no evidence of folding in rocks at the surface or in the subsurface. Vertical fractures, which are common in the Uinta Formation, extend downward into the upper portion of the Green River Formation and are often filled with gilsonite, a solid, brittle hydrocarbon (see Section 3.1.5.4). These subsurface fractures tend to increase the permeability and porosity of the reservoir rocks. No major faults are present in surface exposures of rock or in the subsurface within the RDG Project Area.

3.1.4 GEOLOGIC HAZARDS

The Project Area is within an area of low seismic potential as classified by the Utah Geological Survey (1994). Hydrogen sulfide (H_2S), a poisonous gas, has not been encountered in any gas wells drilled in the RDG Project Area, though it has been reported to the northwest of the Project Area, within the Seven Sisters field. This H_2S is not naturally occurring; it was caused by bacteria growing in water storage tanks and by underground injection. Other potential hazards within the Project Area include mass movement events such as rockslides, rock falls, and mudflows. Flash flooding in the intermittent stream drainages, caused by intense convective thunderstorms, is another hazard, albeit a rare one.

3.1.5 MINERAL RESOURCES

Mineral resources in the RDG Project Area include oil, natural gas, oil shale, gilsonite, bituminous sandstones (or *bitumen*, or *tar sands*), and building and decorative stone, sand, and gravel.

3.1.5.1 OIL RESOURCES

There is a low to moderate potential for low gravity oil in the Green River Formation within the RDG Project Area. Oil may also occur in the Weber Formation, which is a secondary drilling target of the Proposed Action. To-date, there has been no for-profit oil extraction from the Weber Formation in the RDG Project Area.

3.1.5.2 NATURAL GAS RESOURCES

Natural gas reservoirs, like oil reservoirs, exhibit their own unique "habitat," or fairway, where all the factors of reservoir rock, source rock, trap, and seal exist to cause the accumulation of the resource. The source rocks for the gas generation in the Wasatch Formation and Mesaverde Group are extensive and are from mature delta coals and shales in the Mesaverde Group (Osmond 1992).

The hydrocarbon traps for the Wasatch Formation and the Mesaverde Group are stratigraphic in nature. The gases in these reservoir rocks cannot move laterally or vertically because they are surrounded by finer-grained, floodplain siltstones, mudstones, and shales that have very low permeability. The seals for these stratigraphic traps are tightly cemented siltstones, mudstones or

shales that are associated with the stream channel and floodplain deposits of the Wasatch Formation and Mesaverde Group.

3.1.5.3 OIL SHALE RESOURCES

Oil shale is a compact, sedimentary rock containing large quantities of organic matter that yields oil when distilled (Hunt 1979). The richest oil shale interval within the Project Area, an interval in the Parachute Creek Member within the upper portion of the Green River Formation, is called the Mahogany Zone (Cashion 1967). In the Project Area, the Mahogany Zone occurs both in the subsurface and at the surface. In the southeastern part of the Project Area, the Mahogany Zone measures 30-32 feet thick and yields 28-32 gal of oil per ton. The average overburden to the oil shale interval in the Project Area ranges from zero (exposed at the surface) to 1,600 feet (Smith 1981). In 1981, the USGS established the Southeastern Uinta Basin Known Oil Shale Leasing Area (KOSLA), which has a minimum oil shale yield of 25 gal per ton, a minimum thickness of 25 feet, and a maximum depth of 3,000 feet below the ground surface. The KOSLA encompasses the east half of the RDG Project Area.

3.1.5.4 GILSONITE RESOURCES

Gilsonite is a solid, black, brittle hydrocarbon. It occurs primarily in veins in the Uinta Basin (Bates and Jackson 1980) and is believed to have originated from rich oil shale deposits in the Upper Green River Formation (Hunt 1963). In the Project Area, gilsonite occurs in vertical fractures that cut through the sandstone and siltstone beds of the Uinta Formation. At present, 12 Gilsonite Prospecting Permit Applications are on file with BLM for the RDG Project Area (Table 3-1). Gilsonite veins can cause lost circulation (loss of drilling fluid) problems and also misdirection of drillhole alignments during drilling for oil or gas; at present, however, none of the gilsonite permits conflicts with oil and gas drilling activities in the Project Area.

Table 3-1. Gilsonite Prospecting Permit Applications

Township	Range	Sections
11 South	23 East	1, 3, 10, 11, 13-15, 17 18, 20-27, 33
11 South	24 East	18, 19, 27, 30, 31, 33
12 South	23 East	3, 4, 11, 12
12 South	24 East	3, 4, 7, 17, 18

Source: BLM 1999b.

3.1.5.5 TAR SAND RESOURCES

A tar sand (or bitumen) is a type of oil sand or sandstone from which the lighter fractions of crude oil have escaped, leaving a residual asphalt to fill the voids between sand grains. A tar sand deposit underlies approximately one-eighth of the Project Area. The northern part of the P.R. Spring Special Tar Sands Area, established by the USGS in 1980, encompasses the south half of Sections 31, 32, 33, 35, and 36 of T12S, R24E.

3.1.5.6 SAND, GRAVEL AND STONE RESOURCES (MINERAL MATERIALS)

These mineral materials comprise stones used in decorative building. Some of these decorative stones are regular-shaped pieces of sandstone and siltstone from the Green River Formation that weather in approximate rectangular slabs. Others are derived from alluvial sand and gravel found along Bitter Creek, Long Draw, and Asphalt Wash. No active mineral material sites are located within the RDG Project Area.

3.1.5.7 LOCATABLE MINERALS

The Project Area is within a sedimentary basin that has not been altered by igneous or metamorphic activity and, thus, has a low potential for the occurrence of locatable minerals such as gold, silver, lead, or zinc (Pera et al. 1977). The lands within the Project Area are withdrawn from mineral entry by Executive Order 5327 and Public Land Order 4522 (Oil Shale Withdrawal), subject to pre-existing mining claims that have been maintained under the provisions of the General Mining Law of 1872, as amended. No active mining claims are located within the RDG Project Area.

3.1.5.8 PHOSPHATE

No exploitable phosphate deposits occur near the surface within the RDG Project Area. Phosphate within the Park City Formation is within the RDG Project Area, but it is too deep (more than 15,000 feet) to be profitably exploited.

3.2 WATER RESOURCES

3.2.1 REGIONAL OVERVIEW

The RDG Project Area is located in an arid to semi-arid region within the Uinta Basin. The Uinta Basin is divided into two drainages: the north slope and the south slope of the Uinta Mountains. The north slope is bounded by the Uinta Mountains to the south, the Wyoming border to the north, the Colorado border to the east, and the Bear River Basin to the west. The south slope is bounded by the Uinta Mountains to the north, the Tavaputs Plateau and the Book Cliffs to the south, Diamond Mountain and the Colorado border to the east, and the Wasatch Range to the west. Elevations in the Project Area range from 13,528 feet at Kings Peak in the Uinta Mountains to 4,150 feet where the Green River exits the basin, just above its confluence with the Price River. The principal drainage is the Green River, with the Duchesne and White (which drains the eastern Utah border area, along with part of Colorado) Rivers as major tributaries (UDWaR 1999).

Within the Uinta Basin, the State of Utah has classified five drainages as hydrological sub-units: the Upper Green, the Green, the Ashley-Brush, the Duchesne/Strawberry, and the White. The White sub-unit contains the RDG Project Area.

The White sub-unit lies east of the town of Ouray, Colorado and the Green sub-unit and consists of the White River drainage and Evacuation Creek. The area is part of the Tavaputs Plateau and

the Sweet Water Canyon. Tar sand is found in the sub-unit, primarily in the Green River Formation below the oil shale layers. Regional aquifers and localized, alluvial aquifers within the Green River Formation, which consist of sandstone, siltstone, shale and limestone, contribute to the surface water and groundwater resources within the Project Area. Rock structure within the area is relatively simple; the strata tilt a few degrees northwestward, flattening toward the northwest. High, localized permeabilities have been measured in some joints; however, the joints tend to close with depth, resulting in a corresponding decrease in permeability. Gilsonite deposits near Bonanza occupy some of the northwest-trending joints and faults.

Soils within the sub-unit are highly erodible and semi-arid to arid, with low to moderate permeability. With the exception of soils in the floodplains of the White and Green Rivers and along drainages, the soils of the sub-unit are shallow to very shallow (less than 20 inches [51 cm]) and are on sloping to steep upland terraces containing many rock outcrops and rock escarpments.

3.2.2 GROUNDWATER

Groundwater occurs in underground aquifers, which can consist of unconsolidated or consolidated materials. At any given location, the land surface may be underlain by several aquifers, each of which may have different chemical characteristics and/or hydraulic potentials, may be recharged in different locations, and may flow in different directions. Existing water sources, proposed groundwater wells, and the Atchee No. 1 Water Disposal Well within the Project Area are depicted on Map 3-1.

3.2.2.1 OCCURRENCE OF AQUIFERS AND GROUNDWATER FLOW

The Colorado Plateau's aquifers underlie an area of approximately 110,000 square miles in western Colorado, northwestern New Mexico, northeastern Arizona, and eastern Utah, encompassing the Project Area. The principal aquifers associated with the Project Area are the Uinta-Animas aquifer, the Mesaverde aquifer, and the Dakota-Glen Canyon aquifer system. These aquifers underlay the Project Area in the order above, from shallowest to deepest, and are generally separated from each other by low-permeability claystone, shale, marlstone, or limestone (USGS 2005).

These aquifers range in depth below ground surface from less than 500 feet to over 12,000 feet. As the target formations occur at 4,000 feet, 6,000 feet and 10,000 feet, all three aquifers will be discussed. However, as the Uinta-Animas aquifer is the shallowest, and therefore has the greatest potential to be affected by the Proposed Action and alternatives, it will be discussed in the greatest detail.

3.2.2.1.1 Uinta-Animas Aquifer

Within the Project Area, the Uinta-Animas aquifer is present primarily in the Green River and Wasatch Formations, with some limited extension to the Mesaverde Formation. The potentiometric surface of the aquifer generally ranges from approximately 100 feet above land surface (in valleys in areas of groundwater discharge) to approximately 500 feet below land

surface (in upland areas unassociated with streams or other sources of recharge). Groundwater recharge to the aquifer generally occurs in areas of higher altitude along the margins of each basin; it discharges primarily to streams and springs and via transpiration from vegetation (USGS 2005).

The potentiometric surfaces in the three basins containing the Uinta-Animas aquifer are similar in that the surfaces are higher near the margins of the basins and lower near one or two principal streams draining the basins. In the Uinta Basin, the potentiometric surface ranges in altitude from approximately 5,000 to 8,000 feet (USGS 2005), and groundwater primarily flows toward the discharge area along the White and Green Rivers.

In the Uinta Basin, the occurrence of unconsolidated deposits (composed of alluvium, colluvium, and glacial deposits of morainal and outwash origin) is limited; within the Project Area, only the Uinta-Animas aquifer is unconsolidated. It is alluvial in nature and is composed of unconsolidated sand, gravel, and cobbles found along streams. Alluvial aquifers are generally 50 feet in thickness or less and discharge less than 50 gallons per minute (Price and Miller 1975). Depth to alluvial aquifers is highly variable, dependent on seasonal precipitation and recharge.

Water-yielding units in the Uinta-Animas aquifer in the Uinta Basin are commonly separated from each other and from the underlying Mesaverde aquifer by units of low permeability composed of claystone, shale, marlstone, or limestone (USGS 2005). Two secondary aquifers, both consolidated, are associated with the Uinta-Animas aquifer and underlie the Project Area: the Birds Nest aquifer and the Douglas Creek aquifer.

The Birds Nest aquifer, generally associated with the north edge of the Project Area near the White River, lies between the upper part of the Parachute Creek Member and the Mahogany Zone, both part of the Green River Formation. The base of the aquifer is approximately 131 feet above the Mahogany Zone and 50 to 125 feet below the top of the Parachute Creek Member. It is characterized by Nahcolite nodules set in marlstone that are overlain by thin, brittle shale beds and by fine-grained sandstone called Horse Bench Sandstone. These two units, the Nahcolite and Horse Bench Sandstone, define the Birds Nest aquifer. The aquifer is generally 90 to 205 feet in thickness, with an average thickness of 115 feet. This aquifer's permeability is caused by the dissolution of the Nahcolite and fracturing in the sandstones. Flow rates in the Birds Nest aquifer range from 0.007 to 0.500 gallons per minute (VTN 1977).

The Douglas Creek aquifer is located along the southern and eastern margins of the basin where the rocks primarily consist of lacustrine deposits of claystone, siltstone, and limestone from the Green River Formation. Channel sandstones (sandstones from which springs form) commonly occur within this aquifer as well. These springs can discharge as much as 50 gallons per minute. Permeability varies throughout the aquifer. The Douglas Creek aquifer is capable of discharging 50 to 500 gallons per minute to wells (Cashion 1967). The thickness of the Douglas Creek aquifer generally increases toward the central part of each basin that it underlies, ranging in thickness from zero feet at the southern margin of the aquifer to as much as 9,000 feet in the north-central part of the aquifer. The part of the aquifer in the Douglas Creek Member in the Uinta Basin is approximately 500 feet thick. (USGS 2005). Recharge and discharge are approximately equal in this area and total approximately 1,000 acre-feet per year. Recharge

occurs near the southern margin of the aquifer, and discharge occurs near the White and Green Rivers (USGS 2005).

3.2.2.1.2 Mesaverde Aquifer

The Mesaverde aquifer occupies a water yielding, Frontier Sandstone Member overlying (and confined by) Mancos Shale ranging from 1,000 to 6,000 feet in thickness and presenting a thick barrier to vertical and lateral groundwater flow. In the Uinta Basin, the altitude of the top of the aquifer ranges from approximately 10,000 feet below sea level in the north-central (and deepest) part of the basin to approximately 5,000 feet above sea level near the margins of the basin. Aquifer recharge is generally from upland areas, which receive more precipitation than lower altitude areas near the basin margins, and from inter-basin flow from the Piceance Basin to the east. Groundwater discharges from the aquifer directly to streams, springs, and seeps, by upward movement through confining layers and into overlying aquifers, or by withdrawal from wells. Natural discharge areas are generally associated with streams and rivers such as the Strawberry, Duchesne, and Green Rivers in the Uinta Basin. Water quality in the Mesaverde aquifer is extremely variable; dissolved solids concentrations range from less than 1,000 mg/L in the basin-margin areas to more than 35,000 mg/L in the central part of the Uinta Basin. In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water sources contain relatively fresh water (USGS 2005).

3.2.2.1.3 Dakota-Glen Canyon Aquifer System

The Dakota-Glen Canyon aquifer system includes four permeable zones that are individually referred to as the Dakota aquifer, the Morrison aquifer, the Entrada aquifer, and the Glen Canyon aquifer, and are collectively referred to as the Dakota-Glen Canyon aquifer system. The Dakota aquifer is the unit most pertinent to the Project Area and is located in the Dakota Sandstone and adjacent water-yielding rocks. Depth to the top of the aquifer varies widely, from less than 2,000 feet in many areas to more than 12,000 feet in parts of the Uinta Basin. The few water-level data that are available for the Dakota aquifer tentatively define the potentiometric surface at 5,000–6,000 feet below land surface in the northeastern part of the aquifer, along the Utah-Colorado border.

Major recharge areas occur along the northern margin of the Uinta Basin. Discharge areas occur along the White, Colorado, and Gunnison Rivers. Dissolved solids data are only available for the Glen Canyon aquifer (the lowest in the system) and range from less than 1,000 mg/L (where the aquifer is less than 2,000 feet below land surface) to more than 35,000 mg/L (where the aquifer is deeply buried in parts of the Uinta Basin).

3.2.2.2 RECHARGE/DISCHARGE OF AQUIFERS

Recharge to the consolidated bedrock aquifers occurs by several means. Among them are:

- infiltration of precipitation directly into the fractured bedrock outcrops or into the aquifer from overlying, saturated, unconsolidated deposits;
- upward leakage of groundwater from underlying formations;

- downward leakage of groundwater from overlying formations;
- seepage into the aquifers from streams flowing across outcrops, where the water table is lower than the streambed; and
- inflow of groundwater that originates outside the area but flows into the basin (UDWaR 1999).

Discharge of groundwater from the consolidated bedrock aquifers occurs at springs and seeps and includes seepage into streambeds, through wells, by evapotranspiration, by upward leakage into the overlying formations, and by downward leakage into underlying formations. Small groundwater flows also leave the basin via subsurface flow into neighboring basins.

Basin-wide, the total, annual, estimated recharge of 630,000 acre-feet is divided among:

- infiltration of precipitation (approximately 600,000 acre-feet per year of the total recharge);
- infiltration of irrigation water (approximately 20,000 acre-feet per year); and
- return flow from wells and springs (the remaining 10,000 acre-feet per year).

It has been observed that approximately 80% of the total aquifer recharge takes place in the northern half of the Uinta Basin. This is primarily due to the greater amount of water, particularly in the form of precipitation, that is available to enhance the recharge in the Uinta Mountains, compared to the water available in the much lower upland areas at the southern edge of the basin.

The total, annual, estimated discharge of 630,000 acre-feet is divided among:

- evapotranspiration in vegetated areas (which accounts for 246,000 acre-feet per year);
- seepage to streams and discharge to springs (which, when combined, accounts for 363,000 acre-feet per year); and
- well withdrawal (which accounts for the remaining 21,000 acre-feet per year).

Subsurface inflow and outflow in the Uinta Basin is estimated to be negligible.

3.2.2.3 GROUNDWATER QUALITY

Dissolved-solids concentrations in water in the Uinta-Animas aquifer in the Uinta Basin generally range from 500 to 3,000 milligrams per liter; concentrations can exceed 10,000 milligrams per liter in some of the deeper parts of the Uinta Formation. [Water with a total dissolved solids concentration less than 1,000 milligrams per liter commonly is considered freshwater, while water containing more than 3,000 milligrams per liter is considered too salty to drink and therefore 'saline'. Groundwater with total dissolved solids concentration greater than seawater (approximately 35,000 mg/L) is referred to as brine. (Alley 2003)]. Smaller dissolved-solids concentrations are prevalent near recharge areas where the water usually is a calcium or magnesium bicarbonate type. Larger dissolved-solids concentrations are more common near discharge areas where the water generally is a sodium bicarbonate or sulfate type (USGS 2005).

Water quality data for the Project Area were available from two wells in alluvial aquifers along Asphalt Wash. The first well (located in Section 6, T11S, R24E) produces water (1,170 mg/L total dissolved solids [TDS]; slightly saline) from alluvium along Asphalt Wash at a relatively shallow depth of 223 feet (Hood et al. 1976). The second well (located in Section 7, T11S, R24E) produces water (1,110 mg/L TDS), at a depth range of 50 to 216 feet, from the Upper Uinta Formation (Hood et al. 1976).

From 0 to 3,000 feet, groundwater is fresh to moderately saline (3,000 to 10,000 mg/L). Below 3,000 feet, water is saline (greater than 10,000 mg/L TDS; Howells et al. 1987). Chemical analyses indicate that sodium, potassium, and sulfates are the most common dissolved solids in the Green River Formation (VTN 1977).

3.2.2.4 SUITABILITY OF GROUNDWATER FOR VARIOUS USES

The groundwater from the Birds Nest and Douglas Creek aquifers is of limited use because of its poor quality. The water's sulfate content, hardness, and TDS make the groundwater from the Birds Nest and Douglas Creek unsuitable for most industrial and domestic use unless it is significantly treated. Shallow, alluvial groundwater, however, is useful, mainly for stock watering and industrial activities related to gilsonite (VTN 1977). BLM and Rosewood Resources hold water rights for groundwater in the RDG Project Area (Table 3-2).

Table 3-2. Groundwater Rights in RDG Project Area

Water Right	Location	Owner/Other Information
49-311	NW1/4 of SE1/4 of Sec. 6 of T11S, R24E	BLM / 1.0 acre-foot (water for livestock)
49-312	NE1/4 of SW1/4 of Sec. 7 of T11S, R24E	BLM / 1.0 acre-foot (water for livestock)
49-323	SW1/4 of SE1/4 of Sec. 33 of T11S, R24E	BLM / Kings Well - 0.018 cfs (water for livestock)
49-592	NE1/4 of SW1/4 of Sec. 8 of T11S, R24E	BLM / Center Fork Well - 0.015 cfs (water for livestock and wildlife)
49-594	NE1/4 of SW1/4 of Sec. 18 of T11S, R24E	BLM / Northwest Asphalt Wash Well - 0.015 cfs (water for livestock)
49-598	SW1/4 of NE1/4 of Sec. 7 of T11S, R24E	BLM / Lower Center Fork Well - 0.015 cfs (water for livestock and wildlife)
49-601	SW1/4 of SE1/4 of Sec. 13 of T11S, R23E	BLM / Southwest Asphalt Well - 0.015 cfs (water for livestock)
49-1547	SW1/4 of SE1/4 of Sec. 13 of T11S, R23E	Rosewood Resources, Inc.- 10-year Fixed-time Water Right *Same well as 49-601*
49-1547	SW1/4 of SE1/4 of Sec. 6 of T11S, R24E	Rosewood Resources, Inc. - 10-year Fixed-time Water Right *Same well as 49-311*
49-1547	NE1/4 of SW1/4 of Sec. 8 of T11S, R24E	Rosewood Resources, Inc. - 10-year Fixed-time Water Right *Same well as 49-592*
49-1547	NE1/4 of SW1/4 of Sec. 18 of T11S, R24E	Rosewood Resources, Inc. - 10-year Fixed-time Water Right *Same well as 49-594*

There are 8 wells that have established water rights within the Project Area. It appears that 3 of Rosewood Resources water rights are limited time/10 yr rights on wells that are owned by the BLM. The fourth Rosewood Well appears to be in a different location than the BLM water right and well in NWSE of Section 6, T11S R24E.

3.2.3 SURFACE WATER

3.2.3.1 SURFACE WATER OCCURRENCE

The Green River is the largest river in the Uinta Basin, and the Duchesne and White Rivers are large tributaries flowing into the Green River. Bitter Creek is the primary stream within the Project Area. Other intermittent/ephemeral drainages that are within the Project Area include Asphalt Wash, Atchees Wash, and Saddletree Draw (Map 3-2).

Bitter Creek is considered intermittent under State of Utah's water quality classification system, although it does have beneficial-use designations and is considered perennial in the headwaters higher in the Book Cliffs, south of the Project Area. Lower Bitter Creek, within the Project Area, is often dry during late summer and fall. State of Utah water quality use designations (UDEQ 2002) for Bitter Creek are as follows:

2B – Protected for secondary contact recreation such as boating, wading, or similar uses.

3A – Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

4 – Protected for agricultural uses including irrigation of crops and stock watering.

3.2.3.2 SURFACE WATER QUALITY

There are no water quality monitoring stations for Bitter Creek within the Project Area. However, water quality data from the closest sampling station, which is located at Cooper Canyon (approximately 5 miles south of the Kings Well Road crossing and upstream of the project), indicate high TDS, exceeding the Class 4 use designation standard (1,200 mg/L TDS) in a total of 18 samples (mean: 2,338 mg/L TDS). In addition, data from this station indicate that Bitter Creek *partially supports* the coldwater fishery standard (3A) for total phosphorus and iron, indicating that the concentrations of those parameters exceeded water quality standards in less than 25% of the samples. Because it is classified as intermittent, Bitter Creek is not on the state's 303(d) list of impaired water bodies (Toole 1998).

The White River, a source of perennial flow approximately 1.5 miles north of the Project Area, is not on Utah's 1998 303(d) list of impaired water bodies (Toole 1998), indicating that the White River *fully supports* its designated beneficial uses. However, Evacuation Creek (1-5 miles east of the project, and a tributary to the White River) *does not support* the designated use, due to frequent exceedences (95%) of the TDS standard for agricultural use (mean: 3,041 mg/L).

3.2.3.3 WATER USE

There are two public water reserves in the Project Area, located in Sections 6 and 7 of T11S, R24E. The Book Cliffs RMP ROD (BLM 1985) excludes surface occupancy in designated public water reserves; therefore, no components of the proposed project would be located within either reserve.

There are also several artesian wells in the Asphalt Wash drainage area that produce continuous water flows. These wells are used by livestock and wildlife and in drilling operations in the Project Area.

3.3 AIR QUALITY

The presence of air pollutant emission sources, atmospheric conditions, and topography are the factors that affect air quality within a region. The number, type, and spatial distribution of emission sources determine the quantity of pollutants emitted into the ambient air. Atmospheric conditions (e.g., wind and temperature) of a region affect how the pollutants will be dispersed horizontally and vertically, as well as their ultimate ground-level concentrations.

3.3.1 CLIMATE

The climate in the Project Area is semi-arid continental, characterized by low relative humidity, extreme evaporation, cold winters, and hot summers. Precipitation amounts vary widely and are strongly dependant on elevation. The lower portions of the Uinta Basin average only 6–8 inches of precipitation per year. Yearly precipitation increases as the land rises in elevation to the south, where it averages 16–20 inches per year (NRCS 1999). Annual precipitation at Bonanza, the nearest reporting station, averages nearly 9 inches. Clear skies prevail for most of the year, with strong solar radiation during the day and rapid nocturnal cooling, creating wide temperature changes daily. The average winter maximum temperature at Bonanza is approximately 30 °F, and the average summer maximum temperature is approximately 90 °F. The average frost-free season is approximately 140 days (WRCC 2002).

The area is subject to frequent temperature inversions that occur when the air temperature near the surface is cooler than the temperature above. Inversions are more intense during winter, when shorter daylight hours and snow cover combine to intensify the temperature difference between the land surface and the air above. Inversions may persist for a day or longer in winter. In summer, early morning inversions are rapidly dissipated by sunshine warming the air near the ground.

The extent to which vertical air movement occurs defines the mixing height (i.e., the depth) of the atmosphere in which pollutants are confined. The mixing height (along with horizontal air flow) is critical to atmospheric dispersion of air emissions. When mixing heights are high, emissions can easily disperse, resulting in low pollutant concentrations. However, low mixing heights inhibit dispersion, resulting in higher pollutant concentrations. Annually, the mean morning mixing heights in the Project Area are slightly above 300 m; mean afternoon mixing heights exceed 2,400 m (Holzworth 1972).

3.3.2 EXISTING AIR QUALITY

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six types of air pollutants, known as *criteria pollutants*. The NAAQS set absolute upper limits for specific air pollutant concentrations. The NAAQS criteria pollutants are nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), ozone (O_3), and particulate matter ($PM_{2.5}$ and PM_{10}). All particulate matter is currently regulated as PM_{10}, which is defined as suspended particles with an aerodynamic diameter of ten microns or less. The EPA has recently established a separate NAAQS for particulate matter less than 2.5 microns in diameter.

Up to two NAAQS are established for any given pollutant: primary NAAQS and secondary NAAQS. The purpose of the primary NAAQS is to protect the public health, whereas the secondary NAAQS were established to protect public welfare. Utah Department of Environmental Quality, Division of Air Quality (UDAQ) also has adopted these standards under state law, so federal air quality standards are incorporated by reference in Utah's State Implementation Plans (SIPs). The national and state standards for criteria pollutants NO_2, CO, SO_2, Pb, O_3, $PM_{2.5}$, and PM_{10} are in Table 3-3.

In addition to the NAAQS requirements outlined above, amendments to the Clean Air Act in 1990 identified provisions for controlling emissions of hazardous air pollutants (HAP) and mandated significant changes to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program.

Section 112 of the Clean Air Act addresses the control of HAP emissions, or air toxics, and includes provisions for the promulgation of NESHAP, or maximum achievable control technology (MACT) standards. The activities and responsibilities required under Section 112 directly affect federal (EPA), state, and local regulatory agencies and necessitate a high degree of coordination and cooperation between the regulators to ensure that these programs are carried out effectively. Section 112(d) is specific to emission standards and states that:

> the EPA must promulgate regulations establishing emission standards (NESHAP) for each category or subcategory of major sources and area sources of HAPs [listed pursuant to Section 112(c)]. The standards must require the maximum degree of emission reduction that the EPA determines to be achievable by each particular source category. Different criteria for maximum achievable control technology (MACT) apply for new and existing sources.

Table 3-3. NAAQS and PSD Increments in Micrograms per Cubic Meter (µg/m³)

Pollutant	Averaging Time [a]	Primary Standard	Secondary Standard	PSD Class I Increment	PSD Class II Increment	PSD Class III Increment
Sulfur dioxide (SO_2)	Annual	80	----	2	20	40
	24-hour	365	----	5	91	182
	3-hour	----	1,300	25	512	700
Nitrogen dioxide (NO_2)	Annual	100	100	2.5	25	50
Carbon monoxide (CO)	8-hour	10,000	10,000	----	----	----
	1-hour	40,000	40,000	----	----	----
Ozone (O_3) [b]	8-hour	157	157	----	----	----
	1-hour	235	235	----	----	----
Lead (Pb)	Quarterly	1.5	1.5	----	----	----
Particulate matter (PM_{10})	Annual	50	50	4	17	34
	24-hour	150	150	8	30	60
Particulate matter ($PM_{2.5}$)	Annual	15	15	----	----	----
	24-hour	65	65	----	----	----

[a] Annual standards are not to be exceeded; short-term standards may be exceeded once per year.

[b] The 1-hour ozone standards are to be implemented on an interim basis until the 8-hour standards go into full effect.

Sources: 40 CFR 50.4 through 50.12, and 40 CFR 51.166(c) (July 1, 2001).

The UDAQ's measurements of air quality are typically taken in urban areas where ambient pollution levels are expected to be the highest. Although no routine monitoring occurs in the Project Area, baseline concentrations in the region are expected to be well below standards based on the remoteness of the region and the lack of major emissions sources. For the purposes of this analysis, baseline concentrations of NO_2 and CO, measured in the nearest urban areas, were normalized to be reflective of the population densities in the Project Area. These estimates were doubled to account for those sources that would not decrease proportionally with population density, such as roadway sources. The resulting values have been used as conservative estimates of existing conditions.

Particulate (PM_{10}) concentrations have been measured at the White Rocks IMPROVE site near Ouray, Utah (population approximately 35), located approximately 60 miles from the Project Area. The characteristics of the White Rocks site are similar to those within the Project Area, and so the measured data from the White Rocks site were assumed to be directly representative of background conditions within the Project Area. Table 3-4 depicts the estimated baseline air pollutant concentrations.

The New Source Review - Prevention of Significant Deterioration (PSD) program is intended to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level, depending on the location's classification. Mandatory federal PSD Class I areas (including Arches and Canyonlands National Parks to the south and the Flat Tops Wilderness Area to the east) allow only minor increases in air pollution, and they also have special provisions to protect Air Quality Related Values (AQRV) such as visibility and atmospheric deposition (acid rain). Most of the region (EPA Region 8) is designated PSD Class II, where moderate increases in air pollution would be allowed. The PSD Class III areas would allow the greatest amount of air pollution. See Table 3-3 for the allowable incremental increases for Class I, II, and III areas.

Although visibility-related background data have not been collected in the Project Area, the National Park Service (NPS) and the U.S. Department of Agriculture – Forest Service (USFS) have identified seasonal "natural" visibility conditions (or reference extinction levels) for the nearest mandatory federal PSD Class I areas (FLAG 2000). In addition, the USFS has provided physical and chemical data for Ned Wilson Lake within the Flat Tops Wilderness Area (personal communication with M. Schmidt, FS, on October 16, 2001).

Based upon the data, the remoteness of the region, and the lack of major emissions sources, the Uinta Basin is designated as an unclassifiable/attainment area for all the criteria pollutants. This means that all criteria pollutants are surmised to be below the designated NAAQS levels. Air quality conditions are surmised to be very good, characterized by limited air pollution emissions sources and good atmospheric dispersion conditions that result in low air pollutant concentrations.

Table 3-4. Measured and Estimated Background Concentrations in µg/m³

Pollutant	Averaging Time	Measured Background Concentration	Estimated Project Area Background Concentration [a]	Monitoring Site Description
Nitrogen dioxide (NO_2)	Annual	45.0	0.2	Provo, Utah (Commercial/Urban/ City Center)
Carbon monoxide (CO)	8-hour	4,959	34	Grand Junction, Colorado (Residential/Urban)
	1-hour	7,776	54	
Particulate matter (PM_{10})	Annual mean	8	8	Station #493352 White Rocks IMPROVE monitoring site near Ouray, Utah (2000-2003)
	Maximum	23	23	

Note: Background concentration information presented in the table above represents the most current data available collected from the closest appropriate monitoring sites. The NO_2 and CO data above were collected in urban and suburban areas while the proposed project site is a remote, rural area. The White Rocks IMPROVE site is a relatively rural location outside of Ouray, Utah (population 35). These data have been utilized in this analysis as described above, as no ambient air quality monitoring information is available for the proposed project site or the immediate area. No new or substantially different data are available to this effort at this time specific to the proposed project site or proximate locations.

[a] Data for NO_2 and CO were not available for the proposed project site so measured data from Provo, Utah and Grand Junction, Colorado were normalized to reflect population densities in Uintah and Duchesne Counties (Uinta Basin) to estimate Project Area background concentrations. An additive 100% margin of safety was applied to all normalized values to account for non-urban/suburban related sources such as roadway sources. Particulate data collected at the White Rocks IMPROVE site were used directly as representative of background conditions within the Project Area. These calculations are not intended to account for differences in terrain, topography or meteorology.

Source: Trinity Consultants 2002.

3.4 SOILS/WATERSHED/FLOODPLAINS

3.4.1 REGIONAL OVERVIEW

The regional area is classified as arid to semi-arid, and the landscape consists of benches, hillslopes, toeslopes, and valley bottoms. Parent materials present include residuum, colluvium, and alluvium, which are derived from sandstone and shale. Soils are found from level bench locations to fairly steep slopes and range from shallow to very deep. Most soils in the region are well drained.

3.4.2 WATERSHED

The northern portion of the Project Area has steeper, more rugged terrain than the southern portion. However, elevation in the Project Area gradually increases from north to south and averages 6,000 feet. Approximately 857 acres of the 79,914-acre Project Area are located on slopes greater than 60%, and 3,294 acres of the Project Area are located on slopes between 40% and 60%. This high-gradient landscape is bisected by ephemeral washes and draws, creating a mosaic of rolling tablelands, steep, exposed scarps, and wash bottoms. Accordingly, the Project Area is riddled with eroded tracts of land. Approximately 30% of land within the Project Area is described in the Book Cliffs RMP as having critical erosion condition areas (BLM 1984). A

stated objective in the 1985 Book Cliffs RMP (1984:65) is to protect severe and critical erosion areas by restricting or mitigating surface disturbance.

Ephemeral washes trend south to north through the Project Area and include Atchees Wash; the west, center, and east forks of Asphalt Wash; the west fork of Saddletree Draw; and Long Draw. Bitter Creek, an intermittent water source within the Project Area, parallels the western project boundary and crosses the extreme southwestern portion of the Project Area. All of these drainages are tributaries of the White River.

Each ephemeral drainage within the Project Area has experienced episodes of gullying and headcutting near its headwaters, especially in the southern portion of the Project Area. This erosion has been caused by historic overgrazing in conjunction with the subsequent, drastic variation in annual precipitation during the 1930s. Since that period of active erosion, it appears that watershed conditions have stabilized. However, there are still portions of drainages with vertical banks, and streambank erosion is likely the current, primary cause of ongoing erosion within in the Project Area.

Most of the historic overgrazing of cool-season grasses and various perennial forbs was concentrated in the valley bottoms. Currently, most of the drainage bottoms are characterized by either dense stands of annual grasses and weeds or pure stands of sagebrush and greasewood with very little herbaceous understory. Historic grazing on steeper slopes and mesas was significantly less, which has left the uplands with strong and diverse plant communities and stable drainage routes.

The Project Area is partially developed, with 139 miles of primary and secondary roads. These roads are rapidly eroding and are the primary sources of sediment within the Project Area. Causes of increased and rapid erosion include improper road replacement or poor road maintenance. Where roads have traversed steep slopes (greater than 40%), increased gullying has occurred from water running down the slopes from the roadways. Where water drains across a road and then turns to parallel the road in an adjacent drainage, accumulating water has a tendency to headcut the road if there is a steep gradient from roadway to wash bottom. Slopes within the Project Area that are greater than 40% are depicted on Map 2-4.

Sediment yields within the Project Area are approximately 1.5 to 3.0 tons per acre per year, which totals between 119,871 and 239,742 tons of sediment yield annually for the entire Project Area. Higher sediment yields occur on steeper slopes, and lower yields occur on gentler slopes and in valley bottoms. Where soil is delivered to a drainage, sediment delivery efficiency is increased. In the rest of the Project Area, however, sediment delivery is inefficient.

3.4.3 SOILS

NRCS and BLM mapped the soils in the Project Area through a third-order soil survey in the early 1980s (NRCS 1997; Map 3-3). Fourteen (14) soil mapping units, composed of one or more soil series, are present within the Project Area. A brief description of each mapping unit is found in Table 3-5, below, which summarizes the soils within the Project Area.

Table 3-5. Characteristics of RDG Project Area Soils

Reclamation Unit (NRCS Map Unit ID)	Soil Series	Slope >35% (volume)	Hydrologic Group	Wind	Water Erosion Hazard	Wind Erosion Hazard	Texture	Erosion Potential
BcB/ (242)	Turzo	0-4	B	No	Slight	Moderate	Loam/Clay loam	Poor - Saline soils, >9 µhos/cm
BS/ (412)	Badland-Rock Outcrop	25-80	D	No	High	Slight	Weathered bedrock	Poor - Steep slopes, shallow soils
CRC2/ (179)	Pherson	2-8	B	No	Slight	Slight	Very gravelly loam	Good
	Hickerson	1-4	B	No	Slight	Moderate	Silty clay loam	Good
EOG2/ (258)	Walknolls	25-50	D	Yes	Moderate	Slight	Channery sandy loam	Poor - Shallow soils, >35% coarse frag
	BS	25-50	D	No	High	Slight	Weathered bedrock	Poor - Steep slopes, shallow soils
FRE2/ (256)	Walknolls	4-25	D	Yes	Slight	Slight	Channery sandy loam	Poor - Shallow soils, >35% coarse frag
FZE2/ (266)	Walknolls	2-25	D	Yes	Slight	Slight	Very channery sandy loam	Poor - Shallow soils, >35% coarse frag
	Uendal	4-8	C	Yes	Slight	Slight	Sandy loam	Good
GZF2/ (259)	Walknolls	2-50	D	Yes	Moderate	Slight	Channery sandy loam	Poor - Shallow soils, >35% coarse frag
	Rock Outcrop	---	D	No	Slight	Slight	Weathered bedrock	Poor - Shallow soils
OUE2/ (257)	Walknolls	4-50	D	Yes	Slight	Slight	Extremely channery sandy loam	Poor - Shallow soils, steep slopes, >35% coarse frag
	Gilston	2-8	B	Yes	Slight	Moderate	Gravelly sandy loam	Good
RYE/ (260)	Walknolls	4-25	D	Yes	Moderate	Slight	Extremely channery sandy loam	Poor - >35% coarse frag
	Bullpen	2-25	B	Yes	Slight	Moderate	Channery loam/Clay loam	
SKC/ (78)	Gilston	2-8	B	No	Slight	Moderate	Gravelly sandy loam	Good

Table 3-5. Characteristics of RDG Project Area Soils

Reclamation Unit (NRCS Map Unit ID)	Soil Series	Slope >35% (volume)	Hydrologic Group	Wind	Water Erosion Hazard	Wind Erosion Hazard	Texture	Erosion Potential
UVH3/ (14)	Badland	50-90	D	No	High	Slight	Weathered bedrock	Poor - Shallow soils, steep slopes, >35% coarse frag
	Walknolls	50-90	D	Yes	High	Slight	Extremely channery sandy loam	
	Rock Outcrop	50-90	D	No	Slight	Slight	Weathered bedrock	
YNE/ (262)	Walknolls	4-25	D	Yes	Moderate	Slight	Extremely channery sandy loam	Poor - >35% coarse frag
	Gilston	2-8	B	Yes	Slight	Moderate	Gravelly sandy loam	
YUE2/ (83)	Gompers	4-25	D	Yes	Slight	Slight	Extremely channery loam	Poor - >35% coarse frag
	Big Pack	2-8	B	No	Slight	Moderate	Loam	Good
ZWE3/ (261)	Walknolls	4-25	D	Yes	Slight	Slight	Extremely channery sandy loam	Poor - >35% coarse frag
	Bullpen	2-25	D	Yes	Slight	Moderate	Channery loam/Clay loam	Good
	Walknolls	4-25	D	Yes	Moderate	Slight	Extremely channery sandy loam	Poor - >35% coarse frag

The Uinta Area Soil Survey (NRCS 1997) rates each of the soil series as having a slight, moderate, high, or very high water and wind erosion hazards. These ratings were developed using soil erodibility and runoff factors and the Wind Erodibility Index, as defined in the National Soil Survey Handbook (NRCS 1996). The wind and water erosion hazards become critical issues when protective vegetation is removed during and following construction activities, such as road and well pad construction. Typically, soils found on steeper slopes have a high water erosion hazard, and soils found on gentler slopes have a low water erosion hazard. Finer-grained soils are at greater risk of wind erosion, and soils with more gravel and/or stones have a lower risk of wind erosion.

Hydrologic groups are used to estimate precipitation runoff where soils are not protected by vegetation. The groups (labeled A through D) are based on infiltration of water when soils are thoroughly wet. In general, the slower the rate of infiltration, the greater the amount of runoff. Group A soils have high rates of infiltration when thoroughly wet; Group B soils have moderate rates of infiltration; Group C soils have a slow rate of infiltration; and Group D soils have a very slow rate of infiltration (see Table 3-5).

Soil suitability for reclamation is described by the NRCS (2005). A soil is defined as "having poor potential for reclamation" if it meets any of the following criteria:

- clay content greater than 60%;
- coarse fragments greater than 35% by volume (because a large number of coarse fragments reduces a soil's available water-holding capacity);
- pH less than 4.5 or greater than 9.1; or
- salinity greater than 9 µhos/cm1.

As shown in Table 3-5, the soils in the Project Area have the following characteristics:

1) Eleven of the fourteen mapping units in the Project Area have soils that are classified as unsuitable for reclamation, based on 35% or more of their makeup consisting of either stones, gravel, and channers, or a composition with less than 9 µhos/cm electrical conductivity;
2) Eleven of the fourteen mapping units in the Project Area have soils that are classified as hydrological Group D (with a very slow rate of infiltration);
3) Seven of the fourteen mapping units in the Project Area have soils that are rated as having moderate or high water erosion hazard;
4) Eight of the fourteen mapping units in the Project Area have soils that are rated as having a moderate wind erosion hazard.

3.4.4 FLOODPLAINS

The U.S. Department of Housing and Urban Development (HUD) and the Federal Emergency Management Agency (FEMA) have designated four drainages within the Project Area as 100-

[1] µhos/cm = millimhos per cm, which is a measure of soil electrical conductivity.

year floodplains (see Map 3-2). The floodplains include Bitter Creek, Saddletree Wash, Atchees Wash, and a combination of the center and west forks of Asphalt Wash.

During flow events that exceed bankfull height, the 100-year floodplains store sediment that has been eroded from upland areas. Most of the sediment transported to and through these washes to the White River is due to infrequent, high-intensity, convective storm events. At one time, the valley floor was the active floodplain for these ephemeral drainages now designated as 100-year floodplains. As a result of downcutting, the once active floodplain is now a terrace positioned 5-6 feet above the channel floor, and a new floodplain is being formed within the channel bottoms. It should be noted that during heavy storm events, the terraces are likely to be inundated and therefore should be considered part of the existing 100-year floodplain.

Executive Order 11988 requires federal agencies to make decisions in a manner that promotes avoidance of adverse impacts and reduces the risk of property loss and human safety due to floodplain development/modification and preserve the natural and beneficial values of floodplains. Floodplain development/modification is allowed only if there are no other feasible alternatives.

3.5 VEGETATION

3.5.1 REGIONAL OVERVIEW

Primarily due to variation in elevation in the Project Area (on and around the Book Cliffs, a gradually-rising plateau), some diversity of vegetation communities exists (Map 3-4). Arid and semi-arid desert shrub vegetation communities are found within the lower elevation areas of the Uinta Basin. As the plateau gently rises, the vegetation generally changes to sagebrush, and then pinyon-juniper. Approximately 3% (2,040 acres) of the Project Area consists of badland-rock outcrop cover, which generally lacks substantial vegetation. Wetlands are found in association with the sparsely scattered seeps, springs, ponds, and perennial streams. Riparian areas are found along the perennial streams and springs (see Sections 3.5.2.4 and 3.6 for additional information concerning wetlands and riparian areas).

The composition and extent of native plant communities have been modified primarily by livestock grazing and, to a lesser degree, by the development and extraction of oil and gas resources. Livestock grazing has decreased native plant species composition and has promoted establishment of noxious weeds. In general, while populations of undesirable weedy species are common where native plant communities have been disturbed or removed, they do not appear to be invasive in undisturbed communities.

3.5.2 VEGETATION TYPES

The vegetation communities identified in this section are described using existing BLM and Utah Gap analysis data (Edwards et al. 1996). Five vegetation communities exist within the 79,914-acre Project Area: desert shrub, badland-rock outcrop, sagebrush, pinyon-juniper, and riparian/wetland. Badland-rock outcrop cover will not be discussed in this section because, as previously stated, it lacks substantial vegetation.

3.5.2.1 DESERT SHRUB

As identified by Utah Gap analysis, this cover type tends to be dominated by shadscale (*Atriplex confertifolia*), green molly (*Kochia Americana*), mat-saltbush (*Atriplex corrugata*), fourwing saltbush (*Atriplex canescens)*, saltlover (*Halogeton glomeratus*), Mormon tea (*Ephedra viridis*), horsebrush (*Tetradymia* spp.), broom snakeweed (*Gutierrezia sarothrae*), and rabbitbrush (*Chrysothamnus* spp.; Edwards et al. 1996). Common associates include greasewood (*Sarcobatus vermiculatus*), and sagebrush (*Artemisia* spp.). Approximately 2% (1,458 acres) of the Project Area consists of desert shrub vegetation.

3.5.2.2 SAGEBRUSH

Approximately 36% (28,345 acres) of the Project Area consists of the sagebrush community and associated vegetation. The sagebrush vegetation community is located primarily in drainage bottoms and along benches within the Project Area. It is dominated by Wyoming big sagebrush (*Artemisia tridentata*), greasewood (in drainages), and black sagebrush (*Artemisia nova*)(on slopes). Associated shrubs may include fourwing saltbush, shadscale, winterfat (*Kraschenninakovia lanata*), rabbitbrush, broom snakeweed, and bitterbrush (*Purshia* spp.). This vegetation community may be co-dominant with a variety of perennial grasses such as bluebunch wheatgrass *(Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), needlegrass (*Achnatherum* spp.), sand dropseed (*Sporobolus cryptandrus*), blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii)*, Indian ricegrass (*Achnathyrum hymenoides*), galleta grass (*Pleuraphis* spp.), and localized populations of cheatgrass (*Bromus tectorum*) (Edwards et al. 1996). In some areas, grazing has completely eliminated understory species.

3.5.2.3 PINYON-JUNIPER

The higher elevation areas of the Project Area support mature stands of Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus* spp.), which occur on almost all slopes and aspects at these elevations. At the lower elevations, where tree densities are less, Utah juniper dominates pinyon pine. Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) is often associated with this vegetation community. Associated understory species may include black sagebrush, rabbitbrush, bitterbrush, and serviceberry (*Amelanchier* spp.) (Edwards et al. 1996). This vegetation community is generally rooted in shallow, stony soil. Approximately 60% (48,071 acres) of the Project Area consists of pinyon-juniper vegetation.

3.5.2.4 RIPARIAN/WETLAND

Plant species found within Project Area's riparian/wetland areas include cattails (*Typha* spp.), common reed (*Phragmites australis*), willow (*Salix* spp.), and saltcedar (*Tamarix ramosissima*), as well as characteristic sedges (*Carex* spp.), (*Scirpus* spp.), and saltgrass (*Distichlis spicata*). Riparian zones and wetlands within the Project Area are dispersed, and total acreages for them have not been determined. More information on these areas can be found in Section 3.6, below.

3.5.3 INVASIVE AND NOXIOUS PLANTS

Undesirable, weedy, herbaceous species occur to varying degrees within disturbed areas throughout the Project Area. A list of these undesirable plant species, as identified in the BLM, VFO's Weed Control Plan, is presented in Appendix F. Such species, introduced primarily by disturbance from transient vehicles, animals, or wind, tend to dominate disturbed sites, and they also tend to invade newly revegetated or reclaimed sites regardless of the species mix that was planted or the climatic regime.

Russian thistle (*Salsola kali*), saltlover, and cheatgrass dominate disturbed areas throughout the Project Area. These species are strong competitors and, once established, are difficult to control.

3.6 RIPARIAN/WETLAND AREAS

The Project Area has a limited number of riparian and/or wetland areas within its boundary. Bitter Creek contains the largest section of riparian vegetation in the Project Area. The 2.1 miles of Bitter Creek that flow through the Project Area are ensconced in approximately 5.6 acres of associated riparian habitat. This section of Bitter Creek is often dry during the late summer and fall and is classified as an intermittent stream by the State of Utah. Bitter Creek is rated as being "Functioning at Risk Condition with upward trend" according to Utah BLM Riparian Policy (UT-93-93).

There are two wetland areas of note in the Project Area. One is located in the main Asphalt Wash drainage downstream from an artesian well. Wetland vegetation extends for 0.61 mile downstream of the artesian well and comprises approximately 2.4 acres. This wetland is rated as being in "Non Functioning Condition." The other wetland area is located in the center fork of Asphalt Wash and is also the result of surface water flowing downstream from an artesian well in the drainage. Riparian vegetation extends downstream from the well for approximately 0.55 mile and comprises approximately 1.13 acres. This wetland area is rated as being in a "Functioning at Risk Condition with upward trend." Other small wetland areas occur near springs and seeps throughout the Project Area.

In the Project Area, these riparian/wetland areas are disproportionately more important to the proper functioning ecosystem of which they are a part than their relative size would indicate. They are especially important in the relatively dry and arid landscape, as they support a diverse population of plant and animal life. Riparian/Wetland areas within the Project Area are depicted on Map 2-5.

3.7 WILDLIFE

3.7.1 REGIONAL OVERVIEW

The wildlife resources commonly found within the Book Cliffs, and more specifically within the RDG Project Area, are diverse and widespread. The presence of a particular species typically depends on the habitat availability, the relative carrying capacities, and the degree of disturbance

to habitat. The Project Area encompasses large, fairly contiguous upland habitats, dissected by incised drainages and canyon systems.

3.7.2 AQUATIC SPECIES

Water resources and associated riparian zones are limited and are some of the habitats most highly valued by wildlife in the region (see Section 3.6, Riparian/Wetland Areas). The prominent drainages dissecting the Project Area include intermittent (or ephemeral) Bitter Creek, Atchees Wash, Asphalt Wash, the west fork of Saddletree Draw, and Long Draw. Habitat value along these drainages and their tributaries is positively correlated with water availability and associated riparian vegetation, which provide beneficial cover, forage, open water for consumption, breeding areas, and brooding habitat. Of these five main drainages, Bitter Creek has the most consistent flow and supports the highest density and diversity of riparian vegetation. The only perennial sources of water for wildlife in the Project Area have been historically associated with a few small springs along the center fork of Asphalt Wash and flowing wells in the center and west forks of Asphalt Wash. Evacuation Creek, which passes within 2 miles of the northeast corner of the Project Area, is a tributary of the White River and is close to an intermittent stream with periods of near zero flows (Baumann et al. 1975).

Because both Bitter Creek and Evacuation Creek are intermittent through or adjacent to the Project Area, respectively, neither contains adequate aquatic habitat to support populations of aquatic species. The speckled dace and mountain sucker could be found within that portion of Bitter Creek flowing through the Project Area during high flow periods; however, the stream frequently dries up during hot, dry summers, resulting in its unsuitability for aquatic habitat. No aquatic species are known to use the streams or ponds emanating from springs or flowing wells in the Asphalt Wash drainage.

Two federal- and state-listed endangered fish species inhabit the White River, immediately north and downstream of the RDG Project Area. Three other fish species, classified as either state threatened or state species of special concern, also use the White River. These fish species will be discussed in Section 3.8.3, Special Status Aquatic Species.

3.7.3 TERRESTRIAL WILDLIFE

3.7.3.1 BIG GAME

The RDG Project Area is within herd unit areas for mule deer, elk, and pronghorn antelope. These species occur throughout the Project Area in areas of suitable habitat. UDWR has identified various types of ranges for each species, including critical and high-value winter ranges (see Map 2-6).

- Critical ranges (as defined by UDWR) are sensitive-use areas that are limited in availability or provide unique qualities for high-interest wildlife. These areas constitute irreplaceable, critical requirements for these species. The function of critical winter range is to provide shelter and forage to big game, ensuring their survival during periods of significant winter stress.

- High-value ranges (as defined by UDWR) are intensive use areas that, due to relatively wide distribution, do not constitute critical values but which are highly important to high-interest wildlife.

BLM defines crucial habitat (rather than critical habitat) as the determining factor in a population's ability to maintain and reproduce itself at a certain level over the long term (1999a).

3.7.3.1.1 Mule Deer

The most prominent big game species present in the study area is mule deer (*Odocoilius hemionus*). Historically, mule deer populations throughout Utah, as throughout the West, have fluctuated due to environmental factors (e.g., drought, severe winters). Deer populations in eastern Utah have declined in recent years but are currently exhibiting signs of recovery. Unusually high deer mortalities in the 1980s and 1990s are primarily attributed to the severe, 1983-1984 and 1992-1993 winters, and to a prolonged, seven-year drought between 1986 and 1992. These conditions decimated the fawn population as well as a large percentage of the adult deer. A very slow recovery of the deer population has occurred since that time. Fawn production and survival, which continued to be low through 1996, began to improve after 1996 with good forage and winter conditions. The current drought is causing severe stress to mule deer, once again reducing their populations and limiting the forage on which they depend. However, these are environmental factors that are beyond human control. Factors within human control that affect the population of mule deer in the Book Cliffs include hunting, grazing, energy development, increased recreation, and predation.

The Project Area is on lands within the Book Cliffs Herd Unit, classified by UDWR as either "critical winter range" or "high-value winter range." The UDWR designated approximately 273,974 acres of mule deer critical winter range within the North Book Cliffs (UDWR 2003), of which 67.4% or 184,658 acres, is administered by BLM. The remainder is split among UDWR, Utah SITLA, and private landowners.

The currently identified critical mule deer winter range of UDWR differs from the crucial habitat designated in the Book Cliffs RMP (BLM 1984), which identifies approximately 221,049 acres of crucial deer winter range and designates 178,200 acres of public land as crucial winter habitat. Essentially, the BLM crucial deer winter range boundary is shifted north, compared to the UDWR critical deer winter range boundary, in consideration of actual winter use areas. The southern boundary of the BLM crucial deer winter range, as defined in the Book Cliffs RMP, also shifted north compared to the UDWR critical deer winter range boundary. Map 2-6 depicts BLM crucial and UDWR critical winter ranges.

Mule deer are not evenly distributed within the 273,974 acres identified as critical winter range by the UDWR. The winter range located between the Seep Ridge Road and Atchee Ridge Road, south of the Kings Well Road, supports a large percentage of the wintering deer within this herd unit (Karpowitz 1984), and the primary drainages within this deer critical winter range provide high-quality forage and cover to support the greatest number of deer (Karpowitz 1984). Deer winter ranges that typically exhibit higher use often include pinyon-juniper woodlands intersected by long drainages and open areas containing fourwing saltbush, Wyoming big

sagebrush, winterfat, and native grasses. The lower vegetation limit of the deer winter range is described as the lower end of the pinyon-juniper belt (Karpowitz 1984).

Ultimately, the RDG Project Area contains 12,758 acres (6%) of crucial deer winter range, as identified by the Book Cliffs RMP (1984), and 33,694 acres (12%) of critical deer winter range, as identified by UDWR (2003). The critical winter range extends generally from the Kings Well Road south to Big Park, which is located directly south of the Project Area (BLM 1984; Karpowitz 1984). Mule deer critical winter range also includes land as far as 8 miles north of the Kings Well Road, along Bitter Creek.

The remaining 46,106 acres within the Project Area, north of the UDWR critical winter range, are considered by the BLM as high-value winter range for mule deer, particularly within the pinyon-juniper community (BLM 1984). Habitat value and associated big game densities decline farther to the north. The area north of the Kings Well Road provides greater habitat value for deer during severe winters, when they may be pushed from their normal wintering areas (Karpowitz 1984).

Mule deer migration within the region predominantly occurs on a north-south axis, as the ridges provide optimal travel corridors (Karpowitz 1984). Although deer use both the drainages and ridgelines for movement between seasonal ranges, no formal migration corridors have been identified within the Project Area.

The absence or presence and quality of summer range are important issues for desert mule deer herds. A small number of mule deer remain in the Project Area year-round, generally in association with the water sources in Bitter Creek and Asphalt Wash; however, no important summer range has been designated for this small population. The Book Cliffs Herd Unit is considered a desert mule deer unit. Desert mule deer typically have a lower reproductive potential and typically take a longer period of time to recover from major population declines, such as the one following the winter of 1992-1993. Historically, the Book Cliffs herds have exhibited lower productivity and slower recovery than higher elevation mule deer herds (UDWR 1998).

3.7.3.1.2 Elk

Elk (*Cervus elaphus*) occur year-round in the Project Area in low numbers but are most common south of Kings Well Road (BLM 1984; Karpowitz 1984). The Project Area is on lands classified by the state as high-value winter range for elk (UDWR 1997a), and critical winter range for elk occurs immediately south of the project boundary (UDWR 1997a). Resident elk also use the low-elevation water resources, such as the flowing wells associated with Bitter Creek and Asphalt Wash (UDWR 1998).

Typically, deer and elk wintering ranges do not overlap much and, thus, do not conflict much. Deep snow and severe storm events often force elk to lower elevations and onto deer winter range, but these same conditions also force most deer to move lower, resulting in relatively consistent separation between elk and deer winter use, regardless of winter conditions (Karpowitz 1984).

3.7.3.1.3 Pronghorn Antelope

Pronghorn *(Antilocapra Americana*) occur on Archy Bench along the western portion of the Project Area and in the vicinity of the Asphalt Wash guzzler. Although this big game species is expanding its range within the Book Cliffs, no seasonal ranges (e.g., winter range, fawning areas) have been designated or identified by the BLM within the Project Area. The existing permanent guzzler located in Asphalt Wash was established primarily to support the resident pronghorn herd and to provide a year-round water source in identified pronghorn habitat. As is true for mule deer populations, pronghorn populations are also being affected by the current drought. At present, their populations are very low, with virtually no recruitment in recent years.

3.7.3.2 RAPTORS

Some of the more common and visible birds within the Project Area include raptors, or birds of prey. The Project Area provides diverse breeding and foraging habitat: higher elevation woodlands, cool desert shrub communities, rocky outcrops, riparian zones, and lower elevation shrublands.

Raptors that commonly breed in the region include the golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensi*s), turkey vulture (*Cathartes aura*), northern harrier, (*Circus cyaneus*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), long-eared owl (*Asio otus*), and great-horned owl (*Bubo virginianus*) (Behle and Perry 1975). A map of raptor nest locations is available for review at the BLM VFO. Accipiters, such as the sharp-shinned hawk (*Accipiter striatus*) and Cooper's hawk (*Accipiter cooperii*), occur in the higher elevation woodlands and along the lower riparian zones, depending upon the season and relative prey availability (UDWR 1997b). The rough-legged hawk winters in the area as well. Likewise, the peregrine falcon (*Falco peregrinus*) occurs in the area on foraging flights from spring through fall; nesting likely occurs in the White River canyons, north of the RDG Project Area. Potential presence of the bald eagle, northern goshawk, short-eared owl, burrowing owl, and ferruginous hawk is discussed further in Section 3.8.2, Special Status Wildlife Species. All raptors and their nests are protected from take or disturbance under the Migratory Bird Treaty Act of 1918 (16 USC, § 703 et seq.), which prohibits killing migratory birds (including raptors) and/or destroying their nests and eggs without a permit. Golden eagles and their nests also are protected under the Bald Eagle Protection Act, amended in 1973 (16 USC, § 669 et seq.).

A total of 19 raptor nest sites have been identified within the Project Area, in at least 17 different territories, based on 2001 raptor inventory data. Of these territories, at least 3 are known to have been occupied recently by golden eagles, and 3 are known red-tailed hawk nesting territories. Additionally, one territory was occupied by a great-horned owl in 1998, and another by a short-eared owl, also in 1998. The recent status of the nests within the other 9 nesting territories is currently unknown. Based on habitat types, species likely to occur, known raptor phrenology, and the lack of recent comprehensive survey data within the Project Area, it is likely that other breeding raptors have established territories and active nest sites within the Project Area. Nest sites could occur on cliff faces, on rock outcrops, in conifers, in the deciduous vegetation associated with the riparian corridors (e.g., Bitter Creek), and in small, scattered, white-tailed prairie dog colonies.

3.7.3.3 UPLAND GAME

Upland game species occurring in the Project Area include greater sage grouse, mourning dove, chukar, and cottontail rabbit.

3.7.3.3.1 Greater Sage Grouse

The greater sage grouse (*Centrocercus urophasianus*) has recently been classified by the state as a sensitive species (UDWR 1997b) and is discussed further in Section 3.8.2, Special Status Wildlife Species. Sage grouse locations are depicted on Map 3-5.

3.7.3.3.2 Mourning Dove

The mourning dove (*Zenaida macroura*) is a common spring and fall migrant and summer resident in the Project Area. Mourning doves occur throughout the Book Cliffs within appropriate habitats. This species is typically associated with open, upland communities with shrubs and trees that are large enough for nesting. Weed patches and grains in proximity to nesting and roosting cover provide excellent food. The mourning dove is a popular game bird.

3.7.3.3.3 Chukar

The chukar (*Alectoris chuckar*) inhabits areas of rocky, grassy, or bushy slopes and creek bottoms in the mountains and rugged canyons of the desert. Low numbers of chukar have been reported in the vicinity of Bitter Creek and other ephemeral drainages located within the Project Area (UDWR 1998).

3.7.3.3.4 Cottontail Rabbit

Two species of cottontail rabbit occupy the RDG Project Area. The mountain cottontail, (*Sylvilagus nuttalli*) is more commonly found in mesic habitats at higher elevations, especially along brushy stream margins such as Bitter Creek and Evacuation Creek (Olsen 1973). Rogers (1997), in a small mammal inventory conducted in Bitter Creek approximately 5 miles south of the Project Area, reported collecting mountain cottontails in riparian, pinyon-juniper, and sagebrush habitats. Desert cottontails (*Sylvilagus audubonii*) are more common in the Project Area, where they exhibit a preference for the more arid, lower elevation habitats. Favored habitats include the greasewood-sagebrush borders of intermittent washes, rock outcrops, desert shrub, and pinyon-juniper (Olsen 1973). Rogers (1997) did not report the desert cottontail in his Bitter Creek study area.

3.7.3.4 FURBEARERS/PREDATORS

Beaver (*Castor Canadensis*) and muskrat (*Ondatra zibethicus*) have been reported in the White River north of the Project Area by Olsen (1973) and in Bitter Creek south of the Project Area by Rogers (1997).

Baumann et al. (1975), in a non-game mammal inventory of the Utah Oil Shale Area that encompassed the entire RDG Project Area, reported that several furbearers/predators were

present and had been collected from the study area, including the above-mentioned beaver and muskrat, coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), mountain lion (*Felis concolor*), and bobcat (*Lynx rufus*).

Although not observed in earlier mammal studies, it is likely that the red fox (*Vulpes vulpes*) also occurs within the RDG Project Area. The species has been increasing in the Uinta Basin since the early 1980s, when it was observed by both UDWR and BLM biologists. Since that time, it has been observed in various habitats ranging from riparian bottomlands and agricultural lands to desert shrub and sagebrush/grassland ecotypes.

The ringtail *(Bassariscus astutus*) is another furbearer/predator that has been documented by past studies (Olsen 1973) as occurring within the Project Area. The ringtail will be discussed further under Section 3.8.2, Special Status Wildlife Species.

3.7.3.4.1 Black Bears

Black bears, although documented as occurring within the RDG Project Area, are much more common south of the project boundary, in the higher–elevation, montane habitats of the Book Cliffs. Black bears do occasionally wander through the area, probably along the major drainages from the Book Cliffs, such as Bitter and Evacuation Creeks. The black bear is pursued as a game species in Utah. Hunting season occurs annually in the fall, on a limited-entry basis.

3.7.3.4.2 Mountain Lions

Mountain lions are most commonly found in the RDG Project Area during the winter months, when they undertake seasonal movements from their summer ranges to follow migrating mule deer to their winter range. Domestic sheep likely also serve as a food source during the winter. The mountain lion is pursued as a game species in Utah. Hunting season occurs annually from December through June, with the majority of the hunting occurring in the winter when snow is available for tracking the animals.

3.7.3.5 SMALL MAMMALS

Small mammal inventories were conducted by Olsen (1973) and Baumann et al. (1975) in the Utah Oil Shale Area, which encompasses the RDG Project Area, and another small mammal inventory was later conducted by Rogers (1997) in the Bitter Creek drainage. Each study confirmed that the deer mouse (*Peromyscus maniculatus*) is the most abundant small mammal in the area and is common across all habitat types. Common bat species in the area are the big brown bat (*Eptesicus fuscus*) and western pipistrelle (*Pipistrellus Hesperus*) (Baumann et al. 1975). Common-to-abundant species, within appropriate habitat types, include the Uintah chipmunk (*Neotamias umbrinus*), white-tailed antelope ground squirrel (*Ammospermophilus leucurus*), golden-mantled ground squirrel (*Spermophilus lateralis*), pinyon mouse (*Peromyscus truei*), desert woodrat (*Neotoma lepida*), and bushy-tailed woodrat (*Neotoma cinerea*) (Olsen 1973; Baumann et al. 1975). Other small mammals found in the area include the black-tailed

jackrabbit (*Lepus californicus*), least chipmunk (*Neotamias minimus*), Apache pocket mouse (*Perognathus apache*), and Ord's kangaroo rat (*Dipodomys ordii*).

3.7.3.6 WATERFOWL AND SHOREBIRDS

Due to the lack of either flowing or standing water in the RDG Project Area, very few waterfowl or shorebird species are found. Numerous species of waterfowl, such as Canada goose (*Branta Canadensis*), mallard (*Anas platyrhynchos*), pintail (*Anas acuta*), and green-winged teal (*Anas crecca*), are found along the White River north of the Project Area. A few mallards and pintails frequent Bitter Creek and Evacuation Creek during the spring. These same species may also frequent the small ponds associated with the flowing wells in Asphalt Wash, and some limited waterfowl nesting may also occur here. Some shorebird species have been recorded on the Bonanza Breeding Bird Survey, including killdeer (*Charadrius vociferous*), spotted sandpiper (*Actitis macularius*), and great blue heron (*Ardea herodias*). These pass through the northern portion of the RDG Project Area and are generally associated with the Evacuation Creek drainage. Killdeer have also been observed in upland locations and in the vicinity of the flowing wells in Asphalt Wash.

3.7.3.7 SONGBIRDS

Common songbird species in the RDG Project Area include rock wren (*Salpinctes obsoletus*), mourning dove (*Zenaida macroura*), cliff swallow (*Petrochelidon pyrrhonota*), pinyon jay (*Gymnorhinus cyanocephalus*), oak titmouse (*Baeolophus inornatus*), Brewer's sparrow (*Spizella breweri*), and chipping sparrow (*Spizella passerina*). *A Checklist of the Birds of the East Tavaputs Plateau*, compiled by Cranney and Hanberg (1998), lists a total of 135 bird species that may be found in the Book Cliffs. Not all of these species are found within the RDG Project Area. Several point count survey transects have been conducted on or near the RDG Project Area. These have ranged from riparian habitat transects in Southam Canyon, along the White River and near Dragon, to a sagebrush-dominated habitat transect in Big Park, immediately south of the Project Area. The riparian transects at Southam Canyon averaged 27 species of birds, while the sagebrush habitat transect in Big Park recorded 16 species. The difference in species numbers is attributed to the relative quality and diversity of habitat at these two locations.

3.7.3.8 NEOTROPICAL MIGRATORY BIRDS

Neotropical migratory birds that could potentially inhabit the Project Area include sage sparrow (*Amphispiza belli nevadensis*), blue-gray gnat catcher (*Polioptila caerulea*), western kingbird (*Tyrannus verticalis*), Virginia's warbler (*Vermivora virginae*), black-chinned hummingbird (*Archilochus alexandri*), black-throated gray warbler (*Dendroica nigrescens*), gray vireo (*Vireo vicinior*), green-tailed towhee (*Pipilo chlorurus*), Say's phoebe (*Sayornis saya*), savannah sparrow (*Passerculus sandwichensis*), vesper sparrow (*Pooecetes gramineus*), black-throated sparrow (*Amphispiza bilneata*), violet-green swallow (*Tachycineta thalassina),* Gray Flycatcher (*Empidonax wrightii*), Cassin's kingbird (*Tyrannus vociferans*), Lewis's woodpecker (*Melanerpes lewis*), and white-throated swift (*Aeronautes saxatalis*). This list comprises the principal neotropical migratory breeding residents of the area.

3.7.3.9 REPTILES AND AMPHIBIANS

Three common and abundant lizard species in the general area include the sagebrush lizard (*Sceloporus graciosus*), the plateau lizard (*Sceloporus tristichus*) and the tree lizard (*Urosaurus ornatus*). Snakes that are likely present in various habitat types in the RDG Project Area include the western terrestrial garter snake (*Thamnophis sirtalis*) (most likely found around Bitter Creek and the flowing well ponds in Asphalt Wash), gophersnake (*Pituophis catenifer*), striped whipsnake (*Masticophis taeniatus*), and midget faded rattlesnake (*Crotalus oreganus concolor*). Three species of amphibians may be associated with the flowing well ponds in Asphalt Wash or the riparian habitat along Bitter Creek: northern leopard frog (*Rana pipiens*), Woodhouse's toad (*Bufo woodhousii*), and tiger salamander (*Ambystoma tigrinum*). The Great Basin spadefoot toad (*Spea intermontana*) may inhabit upland habitats in the area. A Utah milk snake (*Lampropeltis triangulum*) has been documented from the talus slope in Willow Creek, southwest of the RDG Project Area. The species has also been collected from upland (sagebrush and pinyon-juniper) habitats within the Book Cliffs.

3.8 SPECIAL STATUS SPECIES

This section discusses species that have a special-status designation associated with them. This special-status designation includes:

- species listed as threatened or endangered, proposed for listing as threatened or endangered, or considered a candidate for listing as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS);
- species listed as sensitive by BLM; and
- species listed as threatened, endangered, or a species of special concern by the State of Utah.

In accordance with the Endangered Species Act of 1973, as amended, the lead agency, in coordination with the USFWS, must ensure that any federal action to be authorized, funded, or implemented would not adversely affect a federally listed threatened or endangered species. It is BLM's current policy that USFWS candidate species and State of Utah species of special concern (previously federal category 2 species) and state-sensitive species also be managed to prevent a future federal listing as threatened or endangered.

Initially, 46 species with one or more of these special status designations were considered in this analysis based on known occurrence or potentially suitable habitat in Uintah County: 13 species of plants (Table 3-6), 2 species of reptile, 8 species of fish, 15 species of birds and 8 species of mammals (Table 3-7).

Table 3-6. Special Status Plant Species

Species	Status*	Habitat	Potential for and/or Occurrence
Park rock cress *Arabis vivariensis*	SS	Webber Formation sandstone and limestone outcrops in mixed desert shrub and pinyon-juniper communities, 5,000-6,000 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area.
Horseshoe milkvetch *Astragalus equisolensis*	C	Duchesne River Formation soils in sagebrush, shadscale, horsebrush, and mixed desert shrub communities, 4,790-5,185 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area.
Hamilton milkvetch *Astragalus hamiltonii*	SS	Duchesne and Wasatch Formation soils in pinyon-juniper and desert shrub communities, 5,240-5,800 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area.
Ownbey thistle *Cirsium ownbeyi*	SS	East flank of the Uinta Mountains in sagebrush, juniper and riparian communities, 5,500-6,200 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area. Out of range.
Rock hymenoxys *Hymenoxys lapidicola*	SS	Endemic to Uintah County, found growing in rock crevices on Weber Formation sandstones in ponderosa pine-manzanita communities and pinyon-juniper communities, between 6,000 and 8,100 feet.	None - No potentially suitable habitat exists in the Project Area.
Flowers penstemon *Penstemon flowersii*	SS	Clay badlands in Roosevelt area in shadscale and desert communities, 5,000-5,400 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area.
Goodrich penstemon *Penstemon goodrichii*	SS	Endemic to Uintah and Duchesne Counties in the Lapoint-Tridell-Whiterocks area, on blue-gray to reddish clay badlands of the Duchesne River Formation in shadscale and juniper/mountain mahogany communities, 5,600-6,200 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area.
Graham beardtongue *Penstemon grahamii*	C	East Duchesne and Uintah Counties, shaley knolls in sparsely vegetated desert shrub and pinyon-juniper communities, 4,600-6,700 feet.	Occurs - Populations found in southeast portion of Project Area.

Table 3-6. Special Status Plant Species

Species	Status*	Habitat	Potential for and/or Occurrence
White River beardtongue *Penstemon scariosus* var. *albifluvis*	SS	Green River Formation on sparsely vegetated shale slopes in mixed desert shrub and pinyon-juniper communities, 5,000-6,000 feet.	Potential - Habitat occurs in Project Area. Populations found adjacent to Project Area.
Clay reed-mustard *Schoencrambe argillacea*	E	Book Cliffs on Upper Uinta and Lower Green River Shale Formations in mixed desert shrub of Indian ricegrass and pygmy sagebrush, 5,000-5,650 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area. Out of area identified as suitable habitat range.
Shrubby reed-mustard *Schoencrambe suffrutescens*	E	Green River Shale Formation of calcareous shales in pygmy sagebrush, mountain mahogany, juniper and mixed desert shrub communities, 5,400-6,000 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area. Out of area identified as suitable habitat range.
Uinta Basin hookless cactus *Sclerocactus glaucus*	T	Gravelly hills and terraces on quaternary and tertiary alluvium soils in cold desert shrub communities, 4,700-6,000 feet.	None - No suitable habitat. Formations and associated soils do not occur in the Project Area. Predominance of sandy soils.
Ute ladies'-tresses *Spiranthes diluvialis*	T	Streams, bogs, and open seepages in cottonwood, *Tamarix*, willow, and pinyon-juniper communities, 4,400-6,810 feet.	None - Soils and associated riparian areas are not suitable habitat.

*Status:

E= Taxa formally listed as endangered.

T= Taxa formally listed as threatened.

C= Candidate for federal listing. Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.

SS = BLM sensitive species.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Bald eagle *Haliaeetus leucocephalus*	T	An important habitat component for wintering eagles is the presence of suitable trees for diurnal perching and nocturnal roosting.	Occurs - Bald eagle presence in the Project Area would be fairly common during the winter months (November - March) and would include foraging by migrants and wintering individuals.
Black-footed ferret *Mustela nigripes*	E	This mustelid is closely associated with prairie dog colonies.	Low potential to none - There are no prairie dog colonies of the appropriate size in the Project Area.
Mountain plover *Charadrius montanus*	SPC	This species nests on the ground and is commonly associated with open, barren, sometimes disturbed habitats.	None - A small breeding population of the species occurs on the Myton Bench, northwest of the RDG Project Area, but no habitat is known to be in the Project Area.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C	This species is associated with large patches of riparian woodlands.	Low Potential - The limited riparian habitat in the Project Area is unlikely to support a nesting pair.
American white pelican *Pelecanus erythrorhynchos*	SPC	In Utah, the only known breeding colonies are located in the northern portions of the state, specifically within the Utah Lake/Great Salt Lake ecological complex. Preferred foraging areas are shallow lakes, marshlands, and rivers. Breeding colonies are often 50+ km from foraging areas.	None - There is no suitable habitat to support nesting pelicans.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Ferruginous hawk *Buteo regalis*	SPC	This buteo is typically associated with desert shrub communities and upland woodlands and often uses scattered juniper stringers along the interface between the two habitat types.	Potential - It is possible that this raptor could nest within the Project Area.
Northern goshawk *Accipiter gentilis*	CS	This accipiter typically nests in higher elevations in mature conifer forests and aspen stands, and along valley cottonwood habitats (UDWR 1997b). Winter habitat includes the lower-elevation pinyon-juniper woodlands.	Occurs - The goshawk is known to occur within the Project Area, within the pinyon-juniper community during the winter season. Occurrence of this species would be sporadic in the Project Area.
Greater sage grouse *Centrocercus urophasianus*	SPC	Sage grouse are generally associated with upland shrub communities, breed on open leks (strutting grounds), and nest in nearby sagebrush areas.	Occurs - Suitable breeding habitat has been documented in the northwestern Project Area.
Short-eared owl *Asio flammeus*	SPC	This owl species typically occurs in open desert and semi-desert habitats, particularly near wetland vegetation.	Occurs - One occupied territory was located in 1998 in the Center Fork of Asphalt Wash.
Burrowing owl *Athene cunicularia*	SPC	The burrowing owl typically nests in desert valleys and grasslands and is often associated with dens or burrows within prairie dog colonies.	Potential - The burrowing owl may occur in the Project Area; however, population numbers are likely low.
Mexican spotted owl *Strix occidentalis lucida*	T	This species usually inhabits deep canyons, montane forest habitat, and mature coniferous forest.	Low Potential - This species does not have designated critical habitat within the VFO, but the Book Cliffs planning area has been identified as containing suitable habitat.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Black swift *Cypseloides niger*	SPC	This species occurs in mountainous regions of the western U.S. and Canada. It requires waterfalls for nesting; typically the falls must be permanent. Nesting sites are typically surrounded by coniferous forests, often mixed conifer or spruce-fir forests, but this varies depending on elevation and aspect, and nest sites may include mountain shrub, aspen, or even alpine components. Streams that create the waterfalls are typically mountain riparian habitats.	None - Suitable habitat for this species does not exist in the Project Area.
Bobolink *Dolichonyx oryzivorus*	SPC	This species was historically common but is now a rare nester in flooded grasslands and wet meadows of northern Utah. It summers in the northern regions of North America and winters in South America. The range of the bobolink has decreased, in Utah and across its entire range, because of habitat loss from drought and agricultural practices.	None - There is no wet meadow habitat in the Project Area.
Lewis' woodpecker *Melanerpes lewis*	SPC	This species inhabits open habitats, including pine forests, riparian areas, and pinyon-juniper woodlands. Breeding habitat typically includes ponderosa pines and cottonwoods in stream bottoms and farm areas. In Utah, the species inhabits agricultural lands and urban parks, montane and desert riparian woodlands, and submontane shrub habitats. Its breeding season is mid-May through mid-August.	Low Potential to None - In Utah, the species is widespread, but it is an uncommon nester along the Green River. Breeding by this species has been observed in Ouray and Uintah Counties, and along Pariette Wash.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Long-billed curlew *Numenius americanus*	SPC	This species inhabits shortgrass prairies, alpine meadows, riparian woodlands, and reservoir habitats. Its breeding habitat includes upland areas of shortgrass prairie or grassy meadows with bare ground components, usually near water.	Low Potential to None - This species is a widespread migrant in Utah. Breeding birds are fairly common but localized, primarily in central and northwestern Utah. Potential nesting has been reported in Uintah County but has not been confirmed.
Three-toed woodpecker *Picoides tridactylus*	SPC	The three-toed woodpecker nests and winters in northern coniferous forest and mixed-aspen forest types dominated by spruce, fir, pine, and aspen, usually above 7,800 feet elevation, in the northern regions of North America and the Rocky Mountains.	None - There is no suitable habitat for this species in the Project Area. Small populations have been located along the highest elevations of the Book Cliffs and possibly Diamond Mountain.
Cornsnake *Elaphe guttata*	SPC	This species occurs in northeastern Mexico and throughout much of the southern U.S. east of New Mexico. An isolated population occurs in western Colorado and eastern Utah. It is usually found near streams or in rocky or forest habitats. This species is typically more active at night.	None - This species is not known to occur in Uintah County and there is no suitable habitat in the Project Area.
Smooth greensnake *Opheodrys vernalis*	SPC	This species typically inhabits meadows, grassy marshes, and moist grassy fields along forest edges. Its distribution ranges from northeastern Utah into central Colorado and northern New Mexico, and from the Canadian border south to Kansas and Missouri (the Northern Plains).	None - No moist meadows or marshes are in the Project Area.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
White-tailed prairie dog *Cynomys leucurus*	SPC	White-tailed prairie-dogs form colonies and spend much of their time in underground burrows, often hibernating during the winter. The species breeds in the spring, and young can be seen above ground in early June. The white-tailed prairie dog's diet is composed of grasses and bulbs.	Potential - There is suitable soil and habitat for this species in the Project Area.
Canada lynx *Lynx canadensis*	SPC	This species typically lives in high-elevation coniferous forest, in areas where snowshoe hares are found.	None - Suitable habitat does not occur in the Project Area.
Big free-tailed bat *Nyctinomops macrotis*	SPC	This species occurs in the western U.S., as well as in much of Latin America. The species is rare in Utah, occurring primarily in the southern half of the state, although individuals may occasionally occur in northern Utah. The species prefers rocky and woodland habitats, where roosting occurs in caves, mines, old buildings, and rock crevices. The species is typically active year-round, spending summers in temperate North America and migrating to warmer areas in North America and South America for the winter.	Low Potential to None - Although substantial value habitat has been identified in the Project Area, individuals are not known to occur in the Project Area. Suitable roosting habitat does not occur in the Project Area.
Fringed myotis *Myotis thysanodes*	SPC	This is a small bat that occurs in most of the western U.S., as well as in much of Mexico and part of southwestern Canada. The species is widely distributed throughout Utah but is not very common in the state. The fringed myotis inhabits caves, mines, and buildings, most often in desert and woodland areas.	None - Suitable habitat for this species does not exist in the Project Area.
Townsend's big-eared bat *Corynorhinus townsendii*	SPC	This species is found throughout much of western North America, including areas in the Uinta Mountains and the Book Cliffs. It is a cave-roosting species that moves into man-made caves such as mines and buildings.	None - No caves, mines, or buildings for roosting located in the Project Area.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Spotted bat *Euderma maculatum*	SPC	This bat species occurs in various habitats and elevations but is most often collected in dry, rough, desert terrain. Its distribution is thought to be limited by the availability of roosts (primarily under loose rock or in crevices in rock cliffs). On the south slope of the Uintas, they have been located near steep-walled stream canyons such as Ashley Creek, Black Canyon, and Brush Creek. There was also one detection location on the South Unit of the Project Area in pinyon/juniper/sage at 7400 feet.	Not known within the Project Area.
Kit fox *Vulpes macrotis*	SPC	This species is native to much of the western U.S. and northern Mexico. Although the species is not overly abundant in Utah, it does occur in the western, east-central, and southeastern areas of the state. The kit fox opportunistically eats small mammals (primarily rabbits and hares), small birds, invertebrates, and plant matter. The species is primarily nocturnal, but individuals may be found outside their dens during the day. The species most often occurs in open prairie, plains, and desert habitats.	None - Suitable habitat for this species does not exist in the Project Area.
Colorado pikeminnow *Ptychocheilus lucius*	E	This species is historically associated with the Upper Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Humpback chub *Gila cypha*	E	This species is historically associated with the Upper Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.
Bonytail *Gila elegans*	E	This species is historically associated with the Upper Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.
Razorback sucker *Xyrauchen texanus*	E	This species is historically associated with the Upper Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Roundtail chub *Gila robusta*	CS	This species is endemic to the Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.
Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*	CS	This species is endemic to the Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.
Flannelmouth sucker *Catostomus latipinnis*	CS	This species is endemic to the Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.

Table 3-7. Special Status Wildlife and Aquatic Species

Species	Status*	Habitat	Potential for and/or Occurrence
Bluehead sucker *Catostomus discobolus*	CS	This species is endemic to the Colorado River Basin.	Potential - This fish species does not occur in the drainages within the Project Area. However, the project proponents are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area.

*Federal Status Code:

E= Taxa formally listed as endangered.

T= Taxa formally listed as threatened.

P= Taxa proposed for federal listing.

C=Candidate Taxa with substantial biological information on file to support a proposal to list as endangered or threatened.

*State Status Code.

SPC= Wildlife Species of Concern.

CS = Conservation Species.

3.8.1 SPECIAL STATUS PLANT SPECIES

Thirteen special status plants are currently managed by BLM VFO. Based on evaluations of past sensitive plant surveys, soils, plant communities, and geology, two special status plants, White River beardtongue *(Penstemon scariosus* var. *albifluvis)* and Graham beardtongue *(Penstemon grahamii*) have suitable habitat in the Project Area (see Table 3-6).

Potential habitat exists for White River beardtongue in the Project Area. Populations were found east and north of the project boundaries during field surveys conducted in 1994. The necessary soil type for this species is found within the Project Area. White River beardtongue is often found in association with dragon milkvetch (*Astragalus lutosus*) and in occasional association with Graham beardtongue, both of which occur in the southeast portion of the Project Area.

Graham beardtongue occurs in the Asphalt Wash and Bitter Creek portions of the Project Area, in the gray shale outcrops of the Green River Formation. In addition, surveys conducted in 1982 (Neese and Smith 1982) found eight populations of Graham beardtongue within the Project Area.

3.8.2 SPECIAL STATUS WILDLIFE SPECIES

The special status wildlife species listed in Table 3-7 comprise the federal and state listings for Uintah County, as well as other species considered to be species of special concern by the UDWR (UDWR 1997b). The following subsections address the species that have been found to occur or have the potential to occur (based on habitat) in the Project Area.

3.8.2.1 BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

The USFWS recently down-listed the bald eagle from endangered to threatened (USFWS 1995a). This raptor species also is listed as state-threatened and protected under the Bald Eagle Protection Act. Bald eagle nesting is currently limited in the state to four known locations. One nest has been occupied for the past five years along the White River in Colorado, approximately 10 miles northeast of the northeast corner of the RDG Project Area. Nesting attempts were successful from 1996 to 1998; however, nesting attempts during 1999 and 2000 have failed (Hollowed, 2000 personal communication).

Migrants winter throughout the state, often near open water and riparian corridors, but foraging may extend into more upland habitats. Another important habitat component for wintering eagles includes the presence of suitable trees for diurnal perching and nocturnal roosting (Terres 1991; USFWS 1986). Bald eagle presence in the Project Area would be fairly common during the winter months (November through March) and would include foraging by migrants and wintering individuals. No open water or prominent riparian areas are present to attract concentrations of wintering eagles, although individuals may use the Bitter Creek drainage for sporadic foraging. Bald eagles are known to use the cottonwood bottomlands along the White River, directly north of the RDG Project Area, where they use the cottonwoods for nocturnal roosts and forage along the river for waterfowl, carrion, and small mammals.

3.8.2.2 WESTERN YELLOW-BILLED CUCKOO (*COCCYZUS AMERICANUS OCCIDENTALIS*)

The western yellow-billed cuckoo is listed by the USFWS as a candidate and by the state as threatened. This neotropical migrant nests in riparian areas and may occur along the Bitter Creek drainage; however, it is unlikely that the limited riparian habitat could support a nesting pair. Howe and Hanberg (2000) found several individuals and pairs in cottonwood habitat along the Green River during breeding surveys conducted in 2000. Similar breeding habitat likely occurs north of the RDG Project Area along the White River, but no such habitat occurs within the RDG Project Area itself.

3.8.2.3 FERRUGINOUS HAWK (*BUTEO REGALIS*)

The ferruginous hawk is a state-listed threatened species. This buteo is typically associated with desert shrub communities and upland woodlands and often uses scattered juniper stringers along the interface between the two habitat types. Ferruginous hawks are susceptible to disturbance, particularly during courtship and incubation. This species primarily preys upon small mammals (e.g., ground squirrels, cottontail rabbits, prairie dogs). Although this species is common in parts of Utah, the population numbers decline further south of the White River, probably due to the low number of rodents and other prey species and the lack of preferred nesting habitat. It is possible that this raptor could nest within the Project Area, although the habitat is not considered optimal for breeding birds.

3.8.2.4 NORTHERN GOSHAWK (*ACCIPITER GENTILIS*)

The northern goshawk is classified by the state as a species of special concern. This accipiter typically nests in higher elevations in mature conifer forests, aspen stands, and along valley cottonwood habitats (UDWR 1997b). Winter habitat includes the lower elevation pinyon-juniper woodlands. The goshawk is known to occur within the Project Area, foraging on birds and small mammals within the pinyon-juniper community during the winter season. Occurrence of this large accipiter would be sporadic in the Project Area.

3.8.2.5 GREATER SAGE GROUSE (*CENTROCERCUS UROPHASIANUS*)

The greater sage grouse is considered the most sensitive upland game bird for the Project Area, based on the species' requirements for breeding and brooding habitat. The UDWR (1997b) considers the sage grouse a species of special concern due to declining populations and limited distribution. Since 1967, abundance of male sage grouse attending breeding grounds has declined by approximately 50%. Brood counts and harvest data show a similar downward trend. Sage grouse are generally associated with upland shrub communities, breeding on open leks (strutting grounds) and nesting in nearby sagebrush areas (Terres 1991). Although many grouse are assumed to nest within a 2-mile radius of a lek, nesting distances can be quite variable. A recent study of nesting grouse revealed nests as close as 0.29 mile (1,510 feet), as far as 12.2 miles, with half of all nests occurring within 2.20 miles from the lek of capture (Heath et al. 1997).

Nesting habitat within the Project Area occurs primarily in the southern half of Section 1 and all of Section 12, in the northwestern portion of the Project Area. Suitable breeding habitat has been documented in the northwestern Project Area. In June 1995, two male grouse were observed, and in June 1997, a female and brood were recorded in the same vicinity. Based on these sightings and overall habitat suitability, it is likely that an active lek is present in this area. Sage grouse also have been reported in the Rainbow area, located within the northeast portion of the Project Area, although a population has not been documented (UDWR 1998). A lek was also discovered by UDWR and BLM biologists in March 2001, approximately 1.8 miles east of the northeast corner of the RDG Project Area. Sage grouse locations are depicted on Map 3-5.

3.8.2.6 SHORT-EARED OWL (*ASIO FLAMMEUS*)

The short-eared owl is classified by UDWR as a species of special concern due to declining populations (UDWR 1997b). In northern and central Utah, this owl species typically occurs in open desert and semi-desert habitats, particularly near wetland vegetation. This species may be declining in Utah because of habitat loss associated with agricultural and urban development. Habitat for the short-eared owl exists within the Project Area, particularly in association with intermittent drainages such as Bitter Creek and Asphalt Wash, which contain thick stands of greasewood and big sagebrush, suitable for use as nesting habitat. One territory was inhabited in 1998, in the Center Fork of Asphalt Wash.

3.8.2.7 BURROWING OWL (*ATHENE CUNICULARIA*)

This owl is classified by UDWR as a species of special concern due to declining populations (UDWR 1997b). The burrowing owl typically nests in desert valleys and grasslands and is often associated with dens or burrows within prairie dog colonies. The current population decline in Utah could be attributed to a combination of factors, including habitat loss from agricultural activities and residential development, eradication programs that target burrowing mammals, natural predation, and harassment or disturbance by humans (UDWR 1997b). The burrowing owl may occur in the Project Area; however, if present, population numbers are likely low. Suitable nesting habitat (i.e., burrows) is limited. The greatest likelihood of occurrence would be on Archy Bench, which supports scattered prairie dog colonies. Suitable burrowing owl locations are depicted on Map 3-5.

3.8.2.8 WHITE-TAILED PRAIRIE DOG (*CYNOMYS LEUCURUS*)

The white-tailed prairie dog is one of three prairie dog species found in Utah, occurring in the northeastern part of the state. The species is also found in parts of Colorado, Wyoming, and Montana. Similar to other prairie dogs, white-tailed prairie dogs form colonies and spend much of their time in underground burrows, often hibernating during the winter. The species breeds in the spring, and young can be seen above ground in early June. The white-tailed prairie dog's diet is composed of grasses and bulbs. In turn, the white-tailed prairie dog is the main food source of the Utah population of the endangered black-footed ferret. Major threats to the white-tailed prairie dog include habitat loss, poisoning, and plague.

3.8.3 SPECIAL STATUS AQUATIC SPECIES

The USFWS (1997) identified four federally listed fish species for the project region, historically associated with the Upper Colorado River Basin: Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*). These fish are federally and state-listed as endangered and have experienced severe population declines. Critical habitat has been designated for the four endangered fish in the Green River 100-year floodplain. The White River floodplain north of the Project Area also is designated as critical habitat for the Colorado pikeminnow (USFWS 1995b).

None of these four endangered fish species occurs in the drainages within the Project Area. However, RDG operators are currently proposing to use up to 5 acre-feet of water per year from Evacuation Creek, which is located immediately east of the Project Area. Evacuation Creek is an intermittent tributary to the White River, which joins the Green River approximately 20 miles northwest of the Project Area.

Three additional fish species are endemic to the Colorado River Basin and have been affected by flow alterations, habitat loss or alteration, and introduction of non-native fish: roundtail chub *(Gila robusta)*, flannelmouth sucker *(Catostomus latipinnis)* and bluehead sucker (*Catostomus discobolus)*. The roundtail chub is considered to be a state-listed threatened species, while the two suckers are species of special concern due to declining population numbers and distribution.

3.9 CULTURAL RESOURCES

3.9.1 REGIONAL OVERVIEW

The Uinta Basin and Tavaputs Plateau have been a region of human activity for thousands of years. Much has been written about the prehistory and history of the eastern Utah region, but perhaps the best comprehensive overview, from a cultural resources standpoint, was prepared by Spangler (1995; update in progress). In his study of the region, Spangler incorporated data from southwest Wyoming, northwest Colorado, and areas adjacent to those administered by BLM VFO into his review and synthesis.

As a result of his data analysis, Spangler (1995) divided the cultural history of the broader eastern Utah region into five basic occupation periods/stages. One period, the Archaic, is further divided into sub-periods. The five occupation periods/stages are defined temporally, behaviorally, and technologically. They are largely based upon differences in artifact assemblage data through time, although behavior pattern data and land use practice data are also taken into consideration. The five occupation periods/stages (with sub-periods), provided only as a basic context in which to consider the known cultural resources in the RDG Project Area, are as follows:

1 Paleoindian period 12,000 – 6,000 B.C.
2 Archaic period 6,000 B.C. – A.D. 550
   2a Early Archaic period 6,000 – 3,000 B.C.
   2b Middle Archaic period 3,000 – 500 B.C.
   2c Late Archaic period 500 B.C. – A.D. 550
3 Formative stage A.D. 550 – 1300
4 Shoshonean stage A.D. 1300 – present
5 Historic Euroamerican period A.D. 1776 – present

As it is not the purpose of this document to reproduce this earlier work, interested readers are referred to Spangler (1995) for descriptions and discussions of the occupation periods/stages for this region. Other summary statements concerning the prehistoric period for the area may also be found in Williams et al. 1983; Larralde and Chandler 1980; Aikens and Madsen 1986; Marwitt 1986; Metcalf and Black 1991; and Metcalf et al. 1989.

3.9.2 KNOWN CULTURAL RESOURCES

Review of the cultural resources files, database, and maps at BLM VFO indicated that one Class II and 271 Class III cultural resource inventories had been conducted within the Project Area. The Class II survey consisted of an inventory of 80-acre block sample units selected using probability analysis of lands within the White River KOSLA (Williams et al. 1983). Most of the intensive level, Class III pedestrian inventories were undertaken as part of the NEPA process, as necessary to various APD approval processes. Other Class III surveys were undertaken for projects initiated by BLM or other public land users.

A total of 34 cultural resource sites have been identified and documented as a result of these previous inventories. Nine of the sites are prehistoric in nature, and twenty are from the historical period. Five additional sites date to either the ethnographic period, to multiple periods, or to an unknown period. All of these sites are listed in Table 3-8.

Of the 34 known sites within the Project Area, 27 are on lands administered by the VFO. Six sites are on lands administered by the State of Utah, and one site (Site 42UN1801) crosses multiple land ownerships.

Fifteen of the 34 sites meet or have been recommended as meeting the criteria for eligibility for inclusion on the National Register of Historic Places (NRHP). Eighteen of the sites have been determined or are recommended as being ineligible to the NRHP, and the eligibility of one site, 42UN2604, is unknown.

3.9.2.1 PREHISTORIC CULTURAL RESOURCES

As evidenced by the literature review discussed previously, known prehistoric cultural resource sites within the Project Area are affiliated with the Formative, Shoshonean, and historic Euroamerican periods/stages outlined above. The known Formative- and Shoshonean-stage sites appear to represent the Fremont and Ethnographic Native American populations, respectively. No cultural resources from the Paleoindian or Archaic periods have been documented within the Project Area. Other prehistoric sites, because of a lack of temporally or culturally diagnostic artifacts and/or features, cannot be attributed to period or culture.

3.9.2.2 HISTORICAL CULTURAL RESOURCES

The historical cultural resource sites within the area primarily represent four different historical activities or functional categories: gilsonite mining, ranching, transportation, and unknown. Sites assigned to this last category contained items diagnostic of the historical period but non-diagnostic of site function.

Table 3-8. Cultural Resource Sites Within the Project Area

Site Number	Site Type	NRHP Eligibility[1]	Ownership	Affiliation
Prehistoric Sites				
42UN365	Rock shelter	Eligible	BLM	Unknown
42UN403	Petroglyph	Eligible	BLM	Unknown
42UN2261	Rock shelter	Eligible	BLM	Fremont?
42UN2280	Lithic scatter	Ineligible	BLM	Unknown
42UN2281	Open camp	Eligible	BLM	Unknown
42UN2282	Lithic quarry	Eligible	BLM	Fremont?
42UN2459	Lithic scatter	Ineligible	BLM	Unknown
42UN2585	Open camp	Eligible	BLM	Unknown

Table 3-8. Cultural Resource Sites Within the Project Area

Site Number	Site Type	NRHP Eligibility[1]	Ownership	Affiliation
42UN2603	Lithic/Ceramic scatter	Eligible	State	Fremont
Historic Sites (Grouped by Site Function/Association)				
42UN1495	Trash scatter	Ineligible	BLM	Gilsonite Mining
42UN1801	Railroad	Eligible	Multiple	Gilsonite Mining
42UN2247	Mine	Ineligible	State	Gilsonite Mining
42UN2248	Can scatter	Ineligible	State	Gilsonite Mining?
42UN2551	Trash scatter	Ineligible	BLM	Gilsonite Mining?
42UN2589	Mine	Eligible	BLM	Gilsonite Mining
42UN2601	Mine	Eligible	BLM	Gilsonite Mining
42UN1298	Camp	Ineligible	BLM	Ranching?
42UN2249	Trash scatter	Ineligible	State	Ranching?
42UN2274	Well	Eligible	BLM	Ranching; Kings Well
42UN2278	Trash scatter	Ineligible	BLM	Ranching
42UN2498	Trash scatter	Ineligible	BLM	Ranching?
42UN2588	Camp/Corral	Ineligible	State	Ranching
42UN2604	Corral/Other	Unknown	BLM	Ranching
42UN2606	Camp	Ineligible	BLM	Ranching
42UN2586	Wagon road	Ineligible	BLM	Transportation
42UN2250	Can scatter	Ineligible	State	Unknown
42UN2499	Trash scatter	Ineligible	BLM	Unknown
42UN2547	Rock alignment	Ineligible	BLM	Unknown
42UN2602	Trash scatter	Ineligible	BLM	Unknown
Ethnographic Period Sites[2]				
42UN2581	Open camp	Eligible	BLM	Shoshonean
42UN2582	Open camp	Eligible	BLM	Shoshonean
42UN2587	Wickiup site	Eligible	BLM	Shoshonean
Multiple Component Sites				
42UN2605	Petroglyph	Eligible	BLM	Fremont/ Euroamerican
Period/Culture: Unknown				
42UN2461	Rock pile	Ineligible	BLM	Unknown

[1] Eligibility to the National Register of Historic Places is described as "eligible" or "Ineligible". Eligibility is recommended under the authority of 36 CFR Part 60.4, (a-d).

[2] Ethnographic sites are sites of Native American origin or other cultural origins that were probably occupied during the Historic period.

Cultural resource sites affiliated with gilsonite mining operations are of particular interest, since Utah is the only location in the world where gilsonite is mined (Douglass 1924; Kretchman 1957). Gilsonite, used in numerous industrial processes, was discovered in the Project Area in the 1860s. In 1904, the Uintah Railroad, a narrow-gauge railway (42UN1801), was built from the town of Dragon, Utah, located east of the RDG Project Area, to the town of Mack, Colorado, for the purpose of transporting gilsonite and passengers from the Black Dragon Mine to the main railroad. Other known cultural resources associated with the industry include a railway spur that was built to the mining town of Rainbow in 1911 and the townsite of Rainbow itself (Fessenden 1990; Burton 1996). The now abandoned townsite is located within the RDG Project Area, on the northeastern edge of the project boundary.

The other major historical use of the RDG Project Area to leave sites and traces is the domestic livestock industry. It is almost certain that the ranching culture was present and active by the mid-nineteenth century, and within the Project Area, artifacts predating 1917 have been identified.

Additional known historical period sites reflect the transportation needs of individuals and companies associated with gilsonite mining and livestock ranching. In addition to railroads such as the Uintah Railway, numerous historical wagon roads (e.g., Site 42UN2586) are present within the area, although most have not yet been documented for the archaeological record. Many of these linear features are illustrated on historical General Land Office maps.

3.9.2.3 ADDITIONAL CONSIDERATIONS

Although nearly 300 Class III pedestrian inventories and one Class II sample survey have been undertaken within the Project Area, many portions of the Project Area remain uninventoried. Given the known prehistoric and historical evidence for use of the inventoried areas, cultural resources are undoubtedly present in the uninventoried portions of the Project Area.

The results of the White River KOSLA Class II sample survey provide some indication of where additional sites are likely to be located. The results of the survey were stratified by biome, thus indicating that the greasewood and big sagebrush communities are most likely to contain cultural resources, on a per-acre basis. Pinyon-juniper and desert shrub communities have a lower probability of site occurrence. Any natural disturbance to impact these latter communities, including periodic flooding and debris flows, would further reduce the likelihood of finding significant cultural resources in these biomes.

3.9.3 NATIVE AMERICAN CONSULTATION

Existing legislation and agency procedural guidance mandate that the BLM consult with relevant Native American tribal groups regarding proposed actions on lands under its jurisdiction. In accordance with this mandate, the VFO contacted the Uintah and Ouray Ute Indian Tribe in February 2000 regarding cultural resources, sacred sites, and other areas within the Project Area of traditional or cultural importance to the Tribe. Other tribes interested in the Project Area will receive drafts of this document for review and comment; however, only the Uintah and Ouray

Ute Indian Tribe are party to Native American consultation and coordination. To-date, no concerns have been identified.

3.10 PALEONTOLOGICAL RESOURCES

3.10.1 REGIONAL OVERVIEW

Rather than reiterating here the numerous, existing works on paleontological resources of the Uinta Basin and Tavaputs Plateau, interested readers are referred to the following sources for an overview of the history of paleontology in the area: *Vertebrate Paleontology in Utah* (Gillette 1991); *Geology of Utah* (Stokes 1986); *Paleontology and Geology of the Dinosaur Triangle* (Averett 1987); and "The First Dinosaur Discoveries in the American West" (Breithaupt 1999).

3.10.2 PALEONTOLOGICAL RESOURCES

Although few paleontological surveys have been conducted within the current Project Area, an intensive study conducted immediately to the northeast resulted in the identification of many vertebrate, invertebrate, and plant fossils (Hamblin 1991). The fossil-bearing formations within this study area extend into the current Project Area.[2]

As a management tool, BLM classifies areas of public land based on their potential to contain vertebrate fossils, noteworthy invertebrate fossils, or noteworthy plant fossils. Based on identification and analysis of surficial (surface) geology, areas are also classified according to their general likelihood of containing fossils (Condition 1 through Condition 3; Table 3-9). Either Condition 1 or Condition 2 may initiate formal analysis of existing data, prior to authorizing land use actions involving surface disturbances. Condition 3 is attributed to areas where further paleontological consideration is generally unnecessary (BLM 1998a). These conditions are referenced in the following discussion of known paleontological resources within the Project Area.

The entire Project Area is underlain by bedrock of the Uinta and Green River Formations, both considered by BLM to be Condition 1 for fossil sensitivity. Soils are generally less than 50 cm deep, and bedrock outcroppings are found throughout the Project Area. To-date, only one paleontological locality (42UN947V), an Eocene mammal locality, has been documented within the Project Area.

The Middle to Late Eocene Uinta Formation is the dominant formation within the Project Area. The Uinta Formation was deposited along prehistoric Lake Uinta as it receded during the Tertiary period. More than 70 genera of fish, reptiles, and mammals have been located within exposures of the Uinta Formation. The Uintan Land Mammal Age was defined based on fossil taxa from the Uinta Formation (Armstrong 1991).

[2] Given the paucity of large-scale, paleontological investigations, readers should bear in mind that the fossil localities identified during previous investigations reflect a locational bias. In general, surveys are only conducted in areas proposed for disturbance; previous investigations reflect compliance-driven studies rather than random sampling studies that could be used to predict the location of future fossil discoveries.

Table 3-9. Classification System for Paleontological Formation Localities and Sensitivities[1]

Condition 1:	Areas that are known to contain fossil localities. Consideration of paleontological resources will be necessary if available information indicates that fossils are present in the area.
Condition 2:	Areas with exposure of geological units or settings that are likely to contain fossils. The presence of geologic units from which fossils have been recovered elsewhere will require an assessment of these same units if they occur in the area of consideration.
Condition 3:	Areas that are very unlikely to produce fossils based on their surficial geology, e.g., igneous or metamorphic rocks, extremely young alluvium, colluvium, or eolian deposits.

[1]In keeping with the historical policies adopted by the DOI and BLM, these classification guidelines apply primarily to vertebrate fossils. However, where noteworthy occurrences of invertebrate or plant fossils are known or expected, the same procedures shall be followed; generally will not require protection or salvage operations.

Source: BLM 1998a.

The older Green River Formation, including its Evacuation and Parachute Creek Members, occurs in the southeast and southwest portions of the Project Area; here, Bitter Creek, Evacuation Creek, Asphalt Wash, and other incised drainages have exposed the formation (Marsell 1964; Stokes 1961; Stokes and Madsen 1961). The Green River Formation was formed in the lacustrine (lake) environment of prehistoric Lake Uinta and contains fossils from the Early Eocene through the Late Eocene.

3.11 LAND USE

The principal land uses in the Project Area are livestock grazing, gilsonite mining, oil and gas development, and recreation. Current land use and land ownership within the Project Area and vicinity were reviewed and tabulated using BLM 1:100,000 surface management status maps, BLM master title plats, BLM oil and gas plats, and BLM aerial photos. Any land use constraints within the Book Cliffs RMP were also reviewed and identified.

3.11.1 LAND STATUS/OWNERSHIP

Land ownership within the 79,914-acre Project Area is primarily BLM-administered federal land (88%), interspersed with blocks of state-owned lands (10%) and private lands (2%). Approximately 8,410 acres in the Project Area are owned by the State of Utah and are administered by the School and Institutional Trust Lands Administration (BLM 1984). In general, Sections 2, 16, 32, and 36 in each township were reserved for the support of common schools. Land status within the Project Area is depicted on Map 3-6.

3.11.2 LAND USE

Several public land uses occur within the Project Area. Livestock operations consist primarily of cattle and sheep raising. Public lands administered by BLM VFO are available for oil and gas leasing, exploration, and development. Gilsonite mining is an ongoing enterprise within the

Project Area. The location of active mining is discussed in Section 3.1.5, Geology and Minerals. There are no incorporated cities or towns and no private residences within the Project Area.

No major utility corridors were identified within the Project Area in the 1985 Book Cliffs RMP. However, since 1964, BLM has issued 42 ROW grants within the Project Area: 2 were issued to provide electrical power to gilsonite mines operating within the Project Area; 14 were issued to various oil/gas companies for access roads to well sites; 2 were issued to gilsonite miners for access to their mines; 6 were issued to Uintah County for county-maintained public roads; 16 were issued to various oil/gas operators for transportation pipelines; one was issued for a campsite; and one was issued for a water tank site (Table 3-10).

Table 3-10. Project Area ROW Grants

ROW Number	ROW Grant Holder	Type of ROW Grant	Expiration Date
UTU-23112	Moon Lake Electric	Electric Powerline	10/01/2023
UTU-44902	Moon Lake Electric	Electric Powerline	05/01/2010
UTU-47127	Coastal Oil and Gas	Gas Pipeline	02/15/2010
UTU-52123	Magus Exploration	Gas Pipeline and Compressor	04/11/2013
UTU-57526	Rosewood Resources	Gas Pipeline and Compressor	01/24/2015
UTU-73591	Lone Mountain Production	Gas Pipeline	02/21/2020
UTU-73630	Rosewood Resources	Gas Pipeline	02/31/2026
UTU-73641	Rosewood Resources	Gas Pipeline	02/31/2016
UTU-73643	Wild Horse Energy	Gas Pipeline	No Expiration Date
UTU-74509	Wild Horse Energy	Gas Pipeline	02/31/2026
UTU-77659	Rosewood Resources	Gas Pipeline	02/31/2029
UTU-71131	Questar Gas Management	Gas Pipeline	No Expiration Date
UTU-141804	Wild Horse Energy	Gas Pipeline	No Expiration Date
UTU-73592	Lone Mountain Production	Gas Pipeline	02/31/2025
UTU-74504	Rosewood Resources	Gas Pipeline	02/31/2016
UTU-74518	Rosewood Resources	Gas Pipeline	02/31/2016
UTU-74565	Wild Horse Energy	Gas Pipeline	02/31/2028
UTU-084904	Questar Pipeline	Pipeline Campsite	No Expiration Date
UTU-77656	Ranken Energy	Gas Pipeline	02/31/2030
UTU-77655	Ranken Energy	Access Road	02/31/2020
UTU-74517	Rosewood Resources	Access Road	02/31/2016
UTU-73614	Chesapeake Mid-Cont	Access Road	02/31/2025
UTU-76909	Rosewood Resources	Access Road	02/31/2029
UTU-76892	Lone Mountain Production	Access Road	02/31/2029
UTU-74517	Rosewood Resources	Access Road	02/31/2016
UTU-74505	Rosewood Resources	Access Road	02/31/2026
UTU-73627	Ziegler Chemical and Min	Access Road	02/31/2026
UTU-69111	Rex Corporation	Access Road	02/31/2022

Table 3-10. Project Area ROW Grants

ROW Number	ROW Grant Holder	Type of ROW Grant	Expiration Date
UTU-59116	Rosewood Resources	Access Road	02/07/2026
UTU-59105	Marathon Oil	Access Road	09/30/2016
UTU-57540	Rosewood Resources	Access Road	06/09/2016
UTU-57520	Lone Mountain Production	Access Road	01/24/2015
UTU-57519	Rosewood Resources	Access Road	01/24/2015
UTU-53938	Coastal Oil and Gas	Access Road	10/03/2014
UTU-52111	American Gilsonite	Access Road	05/12/2013
UTU-69125	Uintah County	County Road	No Expiration Date
UTU-69125-15	Uintah County	County Road	No Expiration Date
UTU-69125-13	Uintah County	County Road	No Expiration Date
UTU-69125-09	Uintah County	County Road	No Expiration Date
UTU-69125-02	Uintah County	County Road	No Expiration Date
UTU-69125-01	Uintah County	County Road	No Expiration Date
UTU-73610	Rosewood Resources	Water Tank Site	12/31/2005

3.11.3 LAND USE PLANNING AND MANAGEMENT

The VFO manages BLM-administered public lands within the Project Area. Private land within the area is managed under the Uintah County General Plan (1996). The state land-managing agency, Utah SITLA, has no general land use plan.

3.11.3.1 BUREAU OF LAND MANAGEMENT (BLM)

The Book Cliffs RMP is the management plan for BLM-administered public lands in and surrounding the Project Area (BLM 1984). The current management direction for land use planning in the Book Cliffs area is to lease public lands for oil and gas development, with appropriate protection and mitigation of other resource values. Areas that will receive special mitigation to protect important wildlife, watershed, and recreational values include:

- deer fawning and elk calving areas;
- crucial winter elk, antelope (pronghorn), and sage grouse habitat;
- 100-year floodplains, severe and critical erosion areas, and public water reserves; and
- visual resource management Class II areas and scenic travel corridors.

3.11.3.2 UINTAH COUNTY

Other land uses in the Project Area are directed by the Uintah County General Plan (1996). The Uintah County General Plan supports multiple-use management practices, responsible public land use development, adequate public and private access across and to public lands, participation in wildlife management decisions, a "no net increase of public lands" policy, and

responsible increases of recreational activity on public lands. The county considers the federal government's responsible development of mineral and hydrocarbon resources, as well as the growth and expansion of mineral and hydrocarbon industries, to be important contributors to the county's economic stability (Uintah County 1996).

3.11.4 TRANSPORTATION

The transportation network that serves the Project Area consists primarily of county and BLM-maintained roads, but also of graded oil/gas service roads and two-track ways (see Map 2-1). The network would be used by workers and vehicles hauling equipment and supplies to and from the Project Area. There are approximately 139 miles of two-track ways and graded roads within the Project Area to provide access to existing oil/gas wells, gilsonite operations, pipelines, and ancillary support facilities, grazing improvements, and trails used for recreation and hunting purposes.

The Uintah County General Plan (1996) recognizes that adequate access to and across public lands is vital for efficient transport, use and development of natural resources. In the amended Uintah County General Plan (1998), the county has established the following objectives for ROW corridors:

1. ROW applications will be encouraged within identified corridors while protecting or mitigating other resource values.
2. Additional corridors will be established to facilitate access for oil, gas, and other mining operations.

3.12 LIVESTOCK MANAGEMENT

3.12.1 REGIONAL OVERVIEW

Livestock grazing is a primary use of the public and state lands within the region. Livestock grazing has had a historic yet limited presence in the area, due to the low carrying capacity of the land. This limited carrying capacity is due to the arid vegetation types, ranging from salt desert shrubs to pinyon-juniper. The grazing allotments within the Project Area are depicted on Map 3-7.

3.12.2 CARRYING CAPACITY AND LIVESTOCK MANAGEMENT

The carrying capacity of a livestock grazing allotment is defined in terms of Animal Unit Months (AUMs). An AUM is the amount of forage necessary to sustain one animal weighing 1,000 pounds for one month. In more practical terms, an AUM is the amount of forage needed to sustain one cow and her calf for a month.

All allotments are assigned to one of three management categories: Improvement (I), Maintenance (M), or Custodial (C), based primarily on current resource conditions and the potential for improvement (BLM 1984). The Category I allotments are those having a need and potential for improvement through management. The Category M allotments are those to be

managed to maintain current satisfactory conditions. The Category C allotments are those to be managed on a custodial basis only, to prevent resource deterioration. The evaluation of allotments is dynamic and ongoing, in that the ratings are subject to change as management practices or other factors alter the category into which the allotments fall.

The current, Book Cliffs area planning objective for livestock management is to maintain or improve forage resources using management techniques that are compatible with the use and development of other resources. Livestock are not excluded from wildlife habitat, and mineral development projects requiring reclamation are required to coordinate with BLM VFO to ensure adequate mitigation for livestock (BLM 1984).

3.12.3 ALLOTMENTS IN THE PROJECT AREA

Five BLM grazing allotments intersect with the Project Area. Table 3-11 summarizes the allotment grazing information.

Table 3-11. Summary of BLM Grazing Allotments

Allotment	Total Public Acres	Public Acres in Project Area	Federal AUMs	Federal AUMs in Project Area	Federal Acres/ AUM	Management Category	Livestock Type
Asphalt Draw	38,559	30,608	5,390	3,439	8.9	I	Sheep
Atchee Ridge AMP	110,296	324	11,749	25	12.7	I	Cattle
Olsen AMP	103,214	32,174	9,208	2,872	11.2	M	Sheep
Southam Canyon	12,547	4,202	1,315	385	10.9	M	Sheep
Watson	7,870	2,446	1,258	388	6.3	C	Sheep

Source: BLM 1984.

3.13 RECREATION

3.13.1 REGIONAL OVERVIEW

Recreational opportunities in the Uinta Basin, on Uintah County and BLM-managed public lands near the Project Area, include hiking; river floating and fishing on the White River; hunting; commercially guided trips; sight-seeing and wildlife viewing; off-highway vehicle (OHV) use; and dispersed camping.

3.13.2 RIVER FLOATING, TRAILS, AND VIEWPOINTS

The White River within the Book Cliffs area is a major resource for commercial and non-commercial floating. River float trips recorded for the White River in 1973 indicated only one or two excursions (BLM 1984). In 1999, approximately 2,000 people floated the river. The most popular section of the White River is from the Bonanza Bridge, located 12 river miles west of the

Utah-Colorado border, to the Enron Take-out, located approximately 4 river miles above the Mountain Fuel Bridge. The distance between these two points is 32 miles, and the river float trips typically stop overnight at or near Atchees Wash. Several visual resources exist along this section of the White River to provide additional recreational opportunities. As part of the river experience, an upland route between Atchees Wash and Asphalt Wash, marked using rock cairns, ends at a ridgetop and scenic viewpoint known as the Goblin City Overlook. The overlook has a cairn identifying the spot where, in 1871, John Wesley Powell's men may have stopped when they drew a small sketch resembling the eastward view found in Dellanbaugh's (a member of Powell's survey party) journal. Goblin City is a series of rocky, ridgetop structures, buttes, and square rocks having features similar to towers and spires. When these geological features are viewed telescopically, they resemble a city. The overlook offers recreationists an opportunity to view the area from 800 feet above the river corridor. Portions of the RDG Project Area are visible to the south from the overlook.

3.13.3 HUNTING

Hunting occurs in the fall and winter months and is limited to rabbit, pronghorn antelope, coyote, mountain lion, mule deer, and elk.

3.13.4 OFF-HIGHWAY VEHICLE (OHV) USE

Within the 1985 existing land use plan for the Book Cliffs area, OHV areas are designated as Open, Limited, or Closed. In Open areas, where there are no compelling resource protection needs, user conflicts, or public safety issues, motorized access can occur at any time and any place. A Limited designation in an area restricts OHV use to meet specific resource management objectives. Limitations may be placed on number or type of vehicles, time and season of use, or specific roads. Areas are Closed to OHV use to protect resources, ensure visitor safety, or reduce user conflicts.

Public lands within the western half of the Project Area are designated as Open to OHVs, whereas public lands throughout most of the eastern half of the Project Area are designated as Limited to OHVs (BLM 1984).

Existing roads and trails on Utah SITLA lands are Open to OHV use (as long as the OHV use is consistent with state law and is not in conflict with current leases or permits), unless the lands are signed Closed or previously designated Closed.

3.13.5 RECREATION PLANNING

3.13.5.1 BUREAU OF LAND MANAGEMENT (BLM)

The BLM frequently uses the Recreational Opportunity Spectrum (ROS) in planning recreational opportunities on its public lands. The ROS is a widely used method for determining the level of development within a recreational area, with classifications ranging from developed to primitive types of recreation. The VFO uses this classification as a management tool. The classifications include:

- Primitive B - Consists of roadless areas.
- Semi-primitive B - Consists of non-motorized roadless areas.
- Semi-developed B - Recreation sites exist, motorized travel is permitted.
- Developed B - Developed recreation sites.

The current recreational management objectives of the Book Cliffs RMP are to:

1. Protect the high quality recreation sites, overlooks, and scenic corridors;
2. Protect or mitigate recreational values of the Green and White River corridors; and
3. Designate as much land as possible for OHV use, while protecting areas where damage to resource values might occur (BLM 1984).

A ROS inventory of the Book Cliffs area was performed in 1999, but there have been no management decisions made in any land use plans for lands in the Project Area. Although the initial White River semi-primitive area was inventoried to include the northern portion of the existing RDG Project Area, after subsequent analysis, the ROS boundaries were realigned to be compatible with the realigned White River inventory area and the section line that defines the northern boundary of the RDG Project Area. Therefore, the ROS area no longer occupies any portion of the proposed RDG Project Area.

3.13.5.2 UINTAH COUNTY

Managing impacts of tourism is a major concern of Uintah County. The primary tourism goal of the Uintah County General Plan is to develop strategies to offset increased service provision costs made necessary by increased recreation (Uintah County General Plan 1996).

3.14 VISUAL RESOURCES

The Project Area consists of state, private, and public lands in Uintah County. The project lies within the Uinta Basin of the Colorado Plateau physiographic province, and the general visual characteristics of the Uinta Basin topography south of the White River (and within the RDG Project Area) can be described as relatively flat with wide, shallow valleys not more that a few hundred feet below the surrounding country (Stokes 1986). The landscape is composed of scenery that is typical of the central Uinta Basin. The Project Area is unpopulated and vegetated by pinyon, juniper, sagebrush, and grasses.

3.14.1. BUREAU OF LAND MANAGEMENT (BLM)

Public lands managed by BLM within the Project Area have been classified according to BLM's visual resource management (VRM) system. The VRM system is an analytical process used to inventory, manage, and set objectives for visual resources on public lands. As part of VRM, visual management classes (Class I through IV, Class I being the most protective), or visual ratings, have been identified by BLM that designate various permissible levels of landscape alteration, with the broad goal of protecting the overall visual quality of public lands (see

Appendix D). The VRM classes describe an area in terms of scenic quality, viewer sensitivity to the landscape, and the viewing distance of an area. Once an area has been given a VRM classification, the area classification can be used to determine the visual impacts of proposed activities on the land and to measure the amount of disturbance an area can tolerate before the proposed activity exceeds the VRM objectives for the area. Short-term exceptions (e.g., a growing season) are allowed if VRM objectives are met in the long term.

The current BLM VFO management objective for visual resources is to maintain or improve the scenic quality of the landscape throughout the resource planning area and to design or mitigate all visual intrusions so they do not exceed the established VRM class objectives. Visual resource monitoring is conducted periodically to prevent violations of VRM class objectives.

According to the Book Cliffs RMP, all public lands located within the Project Area, including that portion of the Project Area located within a 5-mile radius of the Goblin City Overlook, are classified as VRM Class IV (major changes to the landscape are allowed). However, as noted below, land east of the Goblin City Overlook has been reinventoried as VRM Class II. Even though the area has been reinventoried, reclassification would not occur until a new land use plan has been approved. VRM reclassification may not affect existing oil and gas leases.

3.14.2 UINTAH COUNTY

The Uintah County General Plan does not have a defined visual quality objective; however, it does state that the federal land management agencies should consider the county's input and interests when making resource management decisions. (Uintah County General Plan 1996). With respect to the Book Cliffs resource area, the Uintah County General Plan states that:

- Scenic corridors will be maintained along major thoroughfares (Highway 40, the Book Cliffs Divide, and the new Bonanza Highway).
- There should be no unreasonable restrictions on oil, gas, and mineral development within the area to protect viewsheds. This applies especially to elevated geographical locations, such as the BLM-proposed Goblin City Overlook (amended Uintah County General Plan 1998).

3.14.3 KEY OBSERVATION POINT (KOP) ANALYSIS AND REINVENTORY

With the increased public use of the White River corridor, a new VRM classification inventory was performed on May 19, 2000, using the Goblin City Overlook as the Key Observation Point (KOP) (BLM 2000). A KOP is a representative viewing area that provides the basis for comparing proposed project impacts to the existing conditions and determining the overall changes that may occur to the landscape. All land east of the overlook in the foreground and middleground (0-4 miles) was reinventoried as a Class II area. This continues north to the canyon rim of the White River and south to the horizon. The western view from the KOP was also inventoried as a Class II in both the foreground and middleground. Portions of the RDG Project Area are located within the Class II reinventory area.

BLM conducted an in-depth viewshed analysis in order to determine the extent of the landscape visible from the Goblin City Overlook (see Map 2-7). This analysis was accomplished through map interpretation and field reconnaissance by the BLM recreation specialist, and the use of a computer-generated, *seen area analysis* that mapped the extent of the landscape visible within 5 miles of the view area. The location of proposed wells and access roads were added to the seen area analysis map in order to analyze the impact of facilities that could be visible from the view area.

3.15 WILDERNESS CHARACTERISTICS

An area including the White River was inventoried by the BLM in 1996 and was determined to have wilderness characteristics (see Map 2-8). A portion of the inventory area is located in the Project Area. The inventory area possesses the wilderness characteristics of naturalness, outstanding opportunities for solitude, outstanding opportunities for primitive and unconfined recreation, and supplemental cultural, scenic, geological, botanical, and wildlife values. The area with wilderness characteristics is 13,500 acres in size.

Areas inventoried and found to have wilderness characteristics are managed according to existing land use plans. When an action is proposed in an area with wilderness characteristics, the BLM prepares a NEPA document to analyze the effects of the action on the wilderness characteristics of the inventory area.

Also within the Project Area are portions of two areas proposed for wilderness designation by the Utah Wilderness Coalition (UWC): the White River and Lower Bitter Creek proposed wilderness units. The BLM has evaluated information submitted on the wilderness characteristics of these two areas and has determined that parts of both units are likely to have wilderness characteristics. The UWC's White River proposed wilderness unit contains 7,096 acres of public land, and the Lower Bitter Creek unit contains 11,547 acres.

For purposes of this EIS, it will be assumed that the UWC proposed wilderness units (the parts that are likely to have wilderness characteristics) are natural and provide outstanding opportunities for solitude and primitive and unconfined recreation. It will also be assumed that UWC's White River wilderness unit contains the same supplemental values of cultural, scenic, geological, botanical, and wildlife as the BLM White River inventory area, and that the UWC Lower Bitter Creek proposed wilderness unit contains supplemental wildlife values that were identified by UWC (see Map 2-8).

Those portions of UWC's White River and Lower Bitter Creek proposed wilderness units likely to have wilderness characteristics, like the BLM White River inventory area, are managed according to the existing land use plan. If actions are proposed in the UWC areas likely to have wilderness characteristics, the BLM conducts the same NEPA process as described above for actions proposed in the BLM inventory areas.

3.16 SOCIOECONOMICS

3.16.1 POPULATION

In 2000, the population of Uintah County was 25,297, with 7,366 in Vernal, the county's largest town. Uintah is the eleventh largest county in Utah and has 5.6 persons per square mile. Uintah County's population has grown at a rate of 1.3% annually, which is noticeably less than the state's annual rate of 2.3%. Overall, the county has grown almost 13% since 1990. It is anticipated that less than 1% of the county's population resides within the Project Area. Approximately 42% of the county's population is urban and 58% is rural, with 1% living on farms. Approximately 10% of Uintah County's population is Native American. Uintah's population is slightly older than Utah's average age of 27.6 years. Put into context, the population of Uintah County represents approximately 1% of Utah's population.

Duchesne County is located to the west and north of the Project Area. In 2000, the population of Duchesne County was 14,397, with 4,400 in Roosevelt, the county's largest town. Duchesne is the fifteenth largest county in Utah and has 4.4 persons per square mile. Duchesne County's population has grown at 1.5% annually. Approximately 7.2% of Duchesne's population is Native American.

3.16.2 EMPLOYMENT

Uintah County has experienced significant changes in its employment base in the past 50 years. Initially, agriculture-related activities such as ranching and farming dominated the economy. Then, during the second half of the twentieth century, the development of oil and gas reserves provided a major contribution to growth. Now, retail trade, private services, and government services together significantly contribute to the county's economy. This evolution in employment base demonstrates Uintah County's shift from an agrarian economy to one that services and supports oil and gas pursuits and the boom in public land industries. Changes in the labor force in recent years are shown in Table 3-12.

Service-based employment contributes much to the job base in the area. Almost two-thirds of Uintah County employees work in retail trade, private services, or government services. While the table below shows a high number of retail, service and government jobs, it should be noted that many of these jobs are in support of the oil, gas, and mining industry. The average annual non-farm wage in Uintah County is $24,780. Out of the top 35 employers in Uintah County, 13 are related to oil, gas and mining, 10 are government service employers, and 7 are retail employers. Unemployment in Uintah County was 4.6% in 2001, significantly higher than the state rate (approximately 3%).

The civilian labor force in Uintah County was 11,029 in 2000 (see Table 3-12 for details), which represents approximately 1% of the state's labor force. Unemployment in the county for the same year was 4.8%, noticeably higher than Utah's overall rate of 3.5%.

Table 3-12. Uintah County Labor Force Statistics

	1996	1997	1998	1999	2000	2001
Labor Force	9,954	10,300	10,544	10,847	11,029	11,707
Non-farm Jobs	7,782	8,328	8,523	8,760	9,261	9,868
Mining	1,116	1,374	1,342	1,232	1,490	1,814
Construction	311	335	395	523	414	414
Manufacturing	231	2,136	201	242	253	199
Trans./Comm./Utilities	586	560	535	524	576	623
Trade	1,869	2,010	2,084	2,100	2,206	2,398
Finance/Ins./Real Estate	127	146	169	167	174	147
Services	1,786	1,939	2,016	2,131	2,164	1,743
Government	1,756	1,751	1,781	1,839	1,984	2,537

Source: Utah Department of Workforce Services 2001.

Duchesne County has experienced significant changes in its employment base in the past 50 years as well. Instead of the dominance of the traditional agrarian economy, trade, public employment, and private services together represent 55% of the jobs. The average annual non-farm wage in Duchesne County is $23,769. Table 3-13 below shows the distribution of jobs in the county.

Table 3-13. Duchesne County Labor Force Statistics

	1999	2000	2001
Labor Force	5,781	5,881	6,280
Non-farm Jobs	4,603	4,764	5,126
Mining	425	517	633
Construction	262	311	383
Manufacturing	137	130	128
Trade/Trans./Utilities	1,177	1,154	1,181
Information	113	111	141
Finance/Ins./Real Estate	116	120	132
Professional/Business Services	2,131	2,164	1,743
Ed./Health/Soc. Services	209	304	421
Leisure/Hospitality	291	322	293
Other Services	110	120	134
Government	1,839	1,984	2,537

Source: Utah Department of Workforce Services 2001.

The civilian labor force for Duchesne County was 5,881 in 2000, which represents approximately one-half percent of the state's labor force. Unemployment for the same year was 6%, one of the highest in Utah.

3.16.3 WAGES

Per capita annual income in Uintah County was $16,922 in 2000, lower than the state average of $23,907. The median household income in Uintah County was $34,518 in 2000 (U.S. Census Bureau 2001). The national threshold for poverty in 2000 was an annual household income of $14,269. Nationally, 11.3% of the population fell below the poverty line in 2000 (U.S. Census Bureau 2001). Approximately 14.5% of all residents of Uintah County fall below the federal poverty line; only San Juan County (26.4%) and Duchesne County (15%) have a higher percentage of the population below the poverty line. The average for the State of Utah is 8% (Utah Department of Workforce Services 2001).

Unemployment in Duchesne County is consistently significantly lower than the state's, at 1.7%. Nonetheless, almost one-third of Duchesne County employees receive unemployment compensation. This can be attributed to the high Native American population and the very low median income of this population. Although per capita annual income in Duchesne County has grown from $8,197 to $11,517 in the past ten years, it is still less than one-half that of the state ($23,907). The median household income for Duchesne County in 2000 was $21,298 (U.S. Census Bureau 2001). Households below an annual income of $14,269 are below the poverty line (U.S. Census Bureau 2001). Duchesne County has the second highest percentage of persons below the poverty line in the state (the highest being San Juan County). Of the total Duchesne County population in 1999 (14,381), 2,178 households (or 15%) reported an income below the poverty line. Nationally, only 11.3% of the population falls below the poverty line.

Total wages and salaries for Uintah County in 2000 were approximately $230 million. Uintah's personal income came to $401 million, with a per capita income (PCI) of $15,453 in 2000, which is approximately two-thirds of the state PCI ($22,200). Total wages and salaries for Duchesne County in 2000 were approximately $113 million. Duchesne County's personal income came to $242 million, with a PCI of $16,369 in 2000.

In 1998, Uintah County had 420 jobs relating to drilling and support activities for oil and gas, as well as 30 jobs in oil and gas extraction, with a payroll of over $12 million. In 1998, Duchesne County had 198 jobs relating to drilling and support activities for oil and gas, as well as 202 jobs in oil and gas extraction, with a payroll of over $12 million. With increased drilling activity in the area during the first three quarters of 2001, oil and gas-related employment is known to have increased, but data are not available.

3.16.4 PUBLIC FINANCE

Revenues from oil and gas development play a significant role in the area's economy, and the contribution from oil and gas is expected to grow over the next several decades. On federal lands, 12.5% of production revenue from oil and gas operations is allocated to the federal government in royalties. Of that total, 10% pays administrative fees, 45% is allocated to the

Reclamation and General Fund within the federal government, and 45% is paid back to the state (BLM 2002a). The state then redistributes 40% of the royalty back to the county of origin, and the majority of the balance is used to fund other projects.

According to the BLM VFO's Draft Resource Management Plan and EIS, the mineral extraction on federal lands in Uintah County generated over $35 million in federal royalties in 2001. The highest non-fluid revenue generator in the county is natural gas, which generated over $30 million in 2001. Oil is the most significant fluid mineral resource, and it generated nearly $3 million in federal royalties in 2001. Oil and gas production in Uintah County represented 21% and 32% of the state totals, respectively (BLM 2002a).

In Duchesne County, the highest revenue generator is oil, generating over $2.8 million in federal royalties in 2001. Natural gas development generated $1.2 million in 2001 for the county. Oil and gas combined provided 90% of the federal royalties generated by Duchesne County.

In 1999, more than $7.1 million in federal royalties (of which $5.4 million came from natural gas) was disbursed to Uintah County, and over $1.2 million in federal royalties (of which $355,114 came from natural gas) was disbursed to Duchesne County. These royalties made up almost 31% of the state's total $30 million in disbursements. These payments substantially increased in 2000, with $10.2 million being generated in Uintah (with more than $8 million coming from gas) and $1.6 million being generated in Duchesne (with $347,208 coming from gas). This increased the importance of Uintah's and Duchesne's contributions to the state overall, which received $36.6 million.

Other financial sources for Uintah County include the royalties received from production on state and privately owned lands, as well as the severance tax and the *ad valorem* tax rates for Uintah County (5% and 3.6%, respectively). RDG operators will pay the county *ad valorem* taxes based on either the production of the well or the depreciated value of the equipment on the property, whichever is higher. With regard to property taxes, Uintah County collected approximately $14.8 million in property taxes in 2001. Approximately 59% of this total was oil and gas property taxes (Uintah County Assessor Office 2002).

It is assumed that approximately 45% to 55% of the $8.4 million in total property taxes collected in Duchesne County was provided by oil and gas property taxes (Utah Bureau of Economic and Business Research 2002).

3.17 NOISE

3.17.1 INTRODUCTION

Noise is generally described as unwanted sound, and noise intensity (or loudness) is measured as sound pressure in units of decibels (dBs). The decibel scale is logarithmic, not linear, because the range of sound that can be detected by the human ear is so great that it is convenient to compress the scale to encompass all the sounds that need to be measured. Each 20-unit increase in the decibel scale increases the sound loudness by a factor of 10.

One method used by the EPA for weighing and correcting differences in human sound frequency response is described as the A-weighted sound level correction. An A-weighting decibel value (dBA) describes either a sound level at a given instant, a maximum sound level, or a steady-state sound level. A long-term, average sound level is considered to be the best measure for quantifying the magnitude of environmental noise and is referred to as the Equivalent Sound Level (L_{eq}). The L_{eq} correlates well with the effects of noise on people, even for wide variations in sound levels and durations. To gain a description of environmental noise for day and night, the Day-Night Sound Level (L_{dn}) is used. The L_{dn} is derived from the average sound levels for a 24-hour period with an additional 10 dB added for sounds that occur during nighttime hours (10 p.m. to 7 a.m.; EPA 1978).

3.17.2 AMBIENT AND EXISTING NOISE LEVELS

Sound levels have been calculated for areas that exhibit typical land uses and population densities. In wilderness areas, ambient L_{dn} sound levels are expected to be approximately 30–40 dB (EPA 1974; Cunniff 1977; Harris 1991).

The proposed RDG Project Area is a rural, unpopulated area with few potential noise sources. Noise levels from human activity are mostly mechanical, consisting mainly of existing oil and gas wells and OHV users. Human noise is widely dispersed throughout the area, and there are very few impacts associated with industrial noise sources and vehicular traffic. Ambient sound levels within the RDG Project Area would be similar to wilderness areas that exhibit an L_{dn} of 30–40 dB. Sensitive noise receptors in the watershed would include wildlife and recreationists visiting the area for solitude and a sense of remoteness.

There are no high-speed roads within the Project Area. Roadway traffic contributes to noise, but this source is transient, produced primarily by OHVs and vehicles used for well maintenance. Topography in the RDG Project Area is relatively flat and open, with gently sloping terrain. This open topography would tend to disperse noise generated by gas exploration and development activities.

3.17.3 ENVIRONMENTAL PROTECTION AGENCY (EPA) NOISE STANDARDS

The EPA has published recommended sound levels that it considers necessary to protect public health and welfare, classified according to areas where human activity is most likely to occur. Table 3-14 presents a summary of the EPA's recommended sound levels.

Table 3-14. Yearly Average[1] Equivalent Sound Levels (Leq) Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety

		Indoor			Outdoor		
	Unit of Measure	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects [(b)]	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects [(b)]
Residential with outside space and farm residences	L_{dn}	45		45	55		55
	$L_{eq\ (24)}$		70			70	
Residential with no outside space	L_{dn}	45		45			
	$L_{eq\ (24)}$		70				
Commercial	$L_{eq\ (24)}$	(a)	70	70(c)	(a)	70	70(c)
Inside transportation	$L_{eq\ (24)}$	(a)	70	(a)			
Industrial	$L_{eq\ (24)\ (d)}$	(a)	70	70(c)	(a)	70	70(c)
Hospitals	L_{dn}	45		45	55		55
	$L_{eq\ (24)}$		70			70	
Educational	$L_{eq\ (24)}$	45		45	55		55
	$L_{eq\ (24)\ (d)}$		70			70	
Farm lands, general unpopulated areas	$L_{eq\ (24)}$				(a)	70	70(c)

(a) Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity.

(b) Based on lowest level.

(c) Based only on hearing loss.

(d) An $L_{eq(8)}$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Note: Explanations of identified level for hearing loss: the exposure period which results in hearing loss at the identified level is a period of 40 years.

[1]Refers to energy rather than arithmetic averages.

Source: EPA 1974.

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